Safety Evaluation Report

Related to the License Renewal of Vogtle Electric Generating Plant, Units 1 and 2

Docket Nos. 50-424 and 50-425

Southern Nuclear Operating Company, Inc.

United States Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

November 2008

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Vogtle Electric Generating Plant (VEGP), Units 1 and 2, license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated June 29, 2007, Southern Nuclear Operating Company, Inc. (SNC 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.” SNC requests renewal of the Units 1 and 2 operating licenses (Facility Operating License Numbers NPF-68 and NPF-81, respectively) for a period of 20 years beyond the current expiration date of January 16, 2027, for Unit 1, and February 9, 2029, for Unit 2.

VEGP is located approximately 26 miles southeast of Augusta, GA. The NRC issued the construction permits for Unit 1 on June 28, 1974, and on June 28, 1974, for Unit 2. The NRC issued the operating licenses for Unit 1 on March 16, 1987, and on March 31, 1989, for Unit 2. Units 1 and 2 are of a dry ambient containment pressurized water reactor design. Westinghouse Electric supplied the nuclear steam supply system and Georgia Power Company originally designed and constructed the balance of the plant with the assistance of its agent, Southern Services and Bechtel. The licensed power output of each unit is 3625 megawatt thermal with a gross electrical output of approximately 1250 megawatt electric.

This SER presents the status of the staff’s review of information submitted through August 12, 2008, the cutoff date for consideration in the SER. The staff identified no open or confirmatory items that would require a formal response from the applicant. SER Section 6 provides the staff’s final conclusion of its LRA review. The staff will present its final conclusion on the LRA review in an update to this SER.

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ABBREVIATIONS

AB	auxiliary building
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ADAMS	Agencywide Document Access and Management System
AERM	aging effect requiring management
AFW	auxiliary feedwater
AISC	American Institute of Steel Construction
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigation system actuation circuitry
ANSI	American National Standards Institute
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
AWWA	American Water Works Association
BAC	boric acid corrosion
BWR	boiling water reactor
B&PV	boiler and pressure vessel
CASS	cast austenitic stainless steel
CCW	component cooling water
CET	core exit thermocouple
CF	chemistry factor
CFR	*Code of Federal Regulations*
CI	confirmatory item
CLB	current licensing basis
COPS	cold overpressure protection system
CRDM	control rod drive mechanism
CR	condition report
CRGT	control rod guide tube
CS	containment spray
CST	condensate storage tank
CTMT	containment
CTB	containment building
CUF	cumulative usage factor
CVCS	chemical and volume control system
DAW	dry active waste
DBA	design basis accident
DBE	design basis event
DC	direct current
DW	demineralized water
ECCS	emergency core cooling system
EDG	emergency diesel generator

EFPY	effective full-power year
EHC	electrohydraulic control
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety feature
FAC	flow-accelerated corrosion
F_{en}	environmental fatigue life correction factor
FP	fire protection
FPP	fire protection plan
FR	*Federal Register*
FRRADS	flood-retaining rooms, alarms, and drain system
FW	feedwater
GALL	Generic Aging Lessons Learned Report
GDC	general design criteria or general design criterion
GEIS	Generic Environmental Impact Statement
GL	generic letter
GPC	Georgia Power Company
GSI	generic safety issue
HAZ	heat-affected zone
HELB	high-energy line break
HE/ME	high energy/moderate energy
HJTC	heated junction thermocouple
HVAC	heating, ventilation, and air conditioning
HX	heat exchanger
I&C	instrumentation and controls
IASCC	irradiation assisted stress corrosion cracking
IEEE	Institute of Electrical and Electronics Engineers
IGA	intergranular attack
IN	information notice
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
LBB	leak-before-break
LOCA	loss of coolant accident
LOSP	loss of offsite power
LR	license renewal
LRA	license renewal application
MPL	master parts list
MSLB	main steam line break
MWe	megawatts electric
MWt	megawatts thermal

NDE	nondestructive examination
NEI	Nuclear Energy Institute
NPS	nominal pipe size (in inches)
NRC	U.S. Nuclear Regulatory Commission
NSCW	nuclear service cooling water
NSR	nonsafety-related
NSSS	nuclear steam supply system
OBE	operating basis earthquake
ODSCC	outside-diameter stress corrosion cracking
OI	open item
P&ID	piping and instrumentation diagram
PRF	penetration room filtration
PSRF	nonsafety-related that can prevent a safety-related function
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PW	pipe whip
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
RAI	request for additional information
RCP	reactor coolant pump
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RI-ISI	risk-informed inservice inspection
RMWST	reactor makeup water storage tank
RPV	reactor pressure vessel
RT_{NDT}	reference temperature for nil ductility transition
RT_{PTS}	reference temperature for pressurized thermal shock
RTS	reactor trip system
RVCH	reactor vessel closure head
RVLIS	reactor vessel level indicating system
RWST	refueling water storage tank
RV	reactor vessel
SBO	station blackout
SCs	structures and components
SCC	stress-corrosion cracking
SER	safety evaluation report
SFP	spent fuel pool
SG	steam generator
SGBD	steam generator blowdown
SI	safety injection
SMP	structural monitoring program
SNC	Southern Nuclear Operating Company, Inc.
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
SSCs	systems, structures, and components
SSE	safe-shutdown earthquake
SW	service water
TLAA	time-limited aging analysis
TS	technical specifications
TSP	trisodium phosphate
UFSAR	updated final safety analysis report
USE	upper-shelf energy
UT	ultrasonic testing
UV	ultraviolet
VEGP	Vogtle Electric Generating Plant
WCAP	Westinghouse Commercial Atomic Power
WOG	Westinghouse Owner's Group

SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) on the license renewal application (LRA) for Vogtle Electric Generating Plant (VEGP), Units 1 and 2, as filed by the Southern Nuclear Operating Company, Inc. (SNC or the applicant). By letter dated June 29, 2007, SNC submitted its application to the U.S. Nuclear Regulatory Commission (NRC) for renewal of the VEGP operating licenses 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, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," of the *Code of Federal Regulations* (10 CFR Part 54). The NRC project manager for the license renewal review is Donnie Ashley. Mr. Ashley may be contacted by telephone at 301-415-3191 or by electronic mail at Donnie.Ashley@nrc.gov. Alternatively, written correspondence may be sent to the following address:

Division of License Renewal
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Washington, DC 20555-0001
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In its June 27, 2007, submission letter, the applicant requested renewal of the operating licenses issued under Section 103 (Operating License Nos. NPF-68 and NPF-81) of the Atomic Energy Act of 1954, as amended, for Units 1 and 2 for a period of 20 years beyond the current expiration date of January 16, 2027, for Unit 1, and February 9, 2029, for Unit 2. Although the Unit 2 license only has 18 years experience, the applicant requested and was granted an exemption on January 9, 2007, (ML062770492) to that requirement prior to the submittal of the application for both units. VEGP is located approximately 26 miles southeast of Augusta, Georgia. The NRC issued the construction permits for Unit 1 on June 28, 1974, and on June 28, 1974, for Unit 2. The NRC issued the operating licenses for Unit 1 on March 16, 1987, and on March 31, 1989, for Unit 2. Units 1 and 2 are a dry ambient containment pressurized water reactor design. Westinghouse Electric supplied the nuclear steam supply system and Georgia Power Company originally designed and constructed the balance of the plant with the assistance of its agent, Southern Services and Bechtel. The licensed power output of each unit is 3565 megawatt thermal with a gross electrical output of approximately 1208 megawatt electric. The updated final safety analysis report (UFSAR) shows 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 VEGP license renewal is based on the applicant's LRA and on its responses to the staff's requests for additional information (RAIs). The applicant supplemented the LRA and provided clarifications through its responses to the staff's RAIs in audits, meetings, and docketed correspondence. Unless otherwise noted, the staff reviewed and considered information submitted through August 12, 2008. The public may view the LRA and all pertinent information and materials, including the UFSAR, at the NRC Public Document Room, located on the first floor of One White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738 (301-415-4737 / 800-397-4209), and at the Burk County Library, 130 Highway 24 South, Waynesboro, Georgia 30830. 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 units' proposed operation for an additional 20 years beyond the term of the current operating licenses. The staff reviewed the LRA in accordance with NRC regulations and the guidance in NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated September 2005.

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

SER Appendix A is a table showing the applicant's commitments for renewal of the operating licenses. SER Appendix B is a chronology of the principal correspondence between the staff and the applicant regarding the LRA review. SER Appendix C is a list of principal contributors to the SER and 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 for license renewals for Units 1 and 2. The staff issued draft, plant-specific GEIS Supplement 34, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 34, Regarding Vogtle Electric Generating Plant, Units 1 and 2, Draft Report for Comment," on April 22, 2008.

1.2 <u>Regulatory Evaluation</u>

1.2.1 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 and can be renewed for up to 20 additional years. The original 40-year license term was selected based on economic and antitrust considerations rather than on technical limitations; however, some individual plant and equipment designs may have been engineered for 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 precluding life extension for 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 10 CFR Part 54, the License Renewal Rule (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 the 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 finds that adverse aging effects on plant systems and components are managed during the period of initial license and that the scope of the review did not allow sufficient credit for management programs, particularly the implementation of 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” which regulates management of plant-aging phenomena. As a result of this finding, the Commission amended 10 CFR Part 54 in 1995. As published May 8, 1995, in 60 FR 22461, amended 10 CFR Part 54 establishes a regulatory process that is simpler, more stable, and more predictable than the previous 10 CFR Part 54. In particular, as amended, 10 CFR Part 54 focuses on the management of adverse aging effects rather than on the identification of age-related degradation unique to license renewal. The rule changes were initiated to ensure that important systems, structures, and components (SSCs) will continue to perform their intended functions during the period of extended operation. In addition, the amended 10 CFR Part 54 clarifies and simplifies the integrated plant assessment process to be consistent with the revised focus on passive, long-lived structures and components (SCs).

Concurrent with these initiatives, the NRC pursued a separate rulemaking effort (61 FR 28467, June 5, 1996) and amended 10 CFR Part 51 to focus the scope of the review of environmental impacts of license renewal in order to fulfill NRC responsibilities under the National Environmental Policy Act of 1969.

1.2.2 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 exceptions 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) whose failure could affect safety-related functions, or (3) are relied on to demonstrate compliance with the NRC’s regulations for fire protection, environmental qualification (EQ), pressurized thermal shock (PTS), anticipated transient without scram (ATWS), and station blackout (SBO).

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).

Those SCs subject to an AMR perform an intended function without moving parts or without change in configuration or properties and are not subject to replacement based on a qualified life or specified time period. Pursuant to 10 CFR 54.21(a), a license renewal applicant must demonstrate that the aging effects will be managed such 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 can be readily 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 with 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 about the length of time the plant can operate are 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 2005, the NRC revised 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 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," issued in June 2005. NEI 95-10 details an acceptable method of implementing 10 CFR Part 54. The staff also used the SRP-LR to review 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 many SCs subject to an AMR. If an applicant commits to implementing these staff-approved AMPs, the time, effort, and resources for LRA review 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 of the SCs used throughout the industry. The report is also a quick reference for both applicants and staff reviewers to AMPs and activities that can manage aging adequately during the period of extended operation.

1.2.3 Environmental Review

Part 51 of 10 CFR contains regulations on 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 "Draft Generic Supplemental Environmental Impact Statement, Vogtle Electric Generating Plant Site, Supplement 34, NUREG-1437", (ML081900016) (GEIS), to document its evaluation of possible environmental impacts associated with nuclear power plant license renewals. For certain types of environmental impacts, the GEIS contains generic findings that apply to all nuclear power plants and 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), a license renewal applicant may incorporate these generic findings in its environmental report. In accordance with 10 CFR 51.53(c)(3)(ii), an environmental report also must 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 there was new and significant information not considered in the GEIS. As part of its scoping process, the staff held a public meeting on September 27, 2007, in Waynesboro, Georgia, to identify plant-specific environmental issues. The draft, plant-specific GEIS Supplement 34 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 June 3, 2008, in Waynesboro, Georgia, to discuss draft, plant-specific GEIS Supplement 34.

1.3 Principal Review Matters

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

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

Pursuant to 10 CFR 54.19(b), the NRC requires that the LRA 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, the applicant stated in the LRA:

> The original Indemnity Agreement for VEGP, which was effective as of August 21, 1986, provides that such agreement "shall terminate at the time of expiration of that license specified in Item 3 of the Attachment, which is the last to expire." The license originally listed in Item 3 of the Attachment was SNM-1967. Since August 21, 1986, however, the Indemnity Agreement has been amended in order to add license numbers NPF-61, NPF-68, SNM-1981, NPF-79 and NPF-81 to Item 3 of the Attachment. As a consequence of these amendments, the existing Indemnity Agreement is presently due to terminate at midnight, February 9, 2029, as the last of these licenses expires. SNC requests that conforming changes be made to Item 3 of the Attachment to the Indemnity Agreement (and any other applicable provisions of the Indemnity Agreement and/or the Attachment) in order to make clear that the Indemnity Agreement is extended until the last expiration date of the

renewed VEGP operating licenses issued by the Commission in response to this application.

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

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

Pursuant to 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 to the facility that affect the contents of the LRA, including the UFSAR supplement. By letter dated June 26, 2008, the applicant submitted an LRA update which summarize the CLB changes that have occurred during the staff's review of the LRA. This submission satisfies 10 CFR 54.21(b) requirements and is still under staff review.

Pursuant to 10 CFR 54.22, "Contents of Application - Technical Specifications," the NRC requires that the LRA include changes or additions to the technical specifications (TSs) that are necessary to manage aging effects during the period of extended operation. In LRA Appendix D, the applicant stated that it had not identified any TS changes necessary for issuance of the renewed VEGP operating licenses. 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 LRA technical information.

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

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 GALL Report.

Table 1.4-1 shows the current set of 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.	**3.0.3.3.5**
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.	**Not Applicable to VEGP**

1.5 Summary of Open Items

As a result of its review of the LRA, including additional information submitted through August 12, 2008, the staff concludes 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 through August 2, 2008, the staff concludes that no confirmatory items exist which would require a formal response from the applicant.

1.7 Summary of Proposed License Conditions

Following the staff's review of the LRA, including subsequent information and clarifications from 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 required by 10 CFR 50.71(e) following the issuance of the renewed licenses.

The second license condition requires that all capsules in the reactor vessel that are removed and tested meet the requirements of American Society for Testing and Materials (ASTM) E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Any changes to the capsule withdrawal schedule, including spare capsules, must be approved by the staff prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the staff, as required by 10 CFR Part 50, Appendix H.

The third license condition requires the applicant to complete the commitments in the UFSAR supplement, and notify the NRC in writing when implementation of those activities required prior to the period of extended operations are complete and can be verified by NRC inspection.

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* (10 CFR 54.21), "Contents of Application Technical Information," requires that each application for license renewal contain an integrated plant assessment (IPA). Furthermore, the IPA must list and identify those structures and components (SCs) that are subject to an aging management review (AMR) from all of the systems, structures, and components (SSCs) that are within the scope of license renewal in accordance with 10 CFR 54.4.

In Section 2.1 of the license renewal application (LRA) "Scoping and Screening Methodology", the applicant described the scoping and screening methodology used to identify the SSCs at Vogtle Electric Generating Plant (VEGP), Units 1 and 2, that are within the scope of license renewal and the SCs that are subject to an AMR. The staff reviewed the Southern Nuclear Operating Company, Inc., (SNC or the applicant), scoping and screening methodology to determine if it is consistent with the scoping requirements stated in 10 CFR 54.4(a) and the screening requirements stated in 10 CFR 54.21.

In developing the scoping and screening methodology for the LRA, the applicant considered the requirements of 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," (the Rule), the statements of consideration related to the Rule, and the guidance provided in Nuclear Energy Institute (NEI) 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule," Revision 6. Additionally, in developing this methodology, the applicant considered the correspondence between the U.S. Nuclear Regulatory Commission (NRC) and other applicants, and NEI.

2.1.2 Summary of Technical Information in the Application

LRA Sections 2.0 and 3.0 provided the technical information required by 10 CFR 54.21(a). In LRA Section 2.1, the applicant described the process used to identify the SSCs that meet the license renewal scoping criteria under 10 CFR 54.4(a), and the process used to identify the SCs that are subject to an AMR, as required by 10 CFR 54.21(a)(1). Additionally, Section 2.2, "Plant-Level Scoping Results;" Section 2.3, "Scoping and Screening Results - Mechanical Systems;" Section 2.4, "Scoping and Screening Results - Structural Systems;" and Section 2.5, "Scoping and Screening Results - Electrical and Instrumentation and Control (I&C) Systems;" of the LRA, provided the results of the process used to identify the SCs that are subject to an AMR. Section 3.0, "Aging Management Review Results," of the LRA, contained the following information: Section 3.1, "Aging Management of Reactor Vessel, Internals and Reactor Coolant System;" Section 3.2, "Aging Management of Engineered Safety Features Systems;" Section 3.3, “Aging Management of Auxiliary Systems;” Section 3.4, “Aging Management of Steam and Power Conversion Systems;” Section 3.5, “Aging Management of Containment, Structures and Component Supports;” and Section 3.6, “Aging Management of Electrical and Instrumentation and Controls (I&C) Components.” Section 4.0 of the LRA, “Time-Limited Aging Analyses (TLAA),” contained the applicant’s identification and evaluation of TLAA.

2.1.3 Scoping and Screening Program Review

The staff evaluated the LRA scoping and screening methodology in accordance with the guidance contained in Section 2.1, “Scoping and Screening Methodology,” of NUREG-1800, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” Revision 1 (SRP-LR). The following regulations form the basis for the acceptance criteria for the scoping and screening methodology review:

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

As part of the review of the applicant’s scoping and screening methodology, the staff reviewed the activities described in the following sections of the LRA using the guidance contained in the SRP-LR:

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

In addition, the staff conducted a scoping and screening methodology audit at the applicant’s corporate facility, located near Birmingham, Alabama, during the week of September 17-21, 2007. The audit focused on ensuring that the applicant had developed and implemented adequate guidance to conduct the scoping and screening of SSCs in accordance with the methodologies described 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. In addition, the staff conducted detailed discussions with the applicant on 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 training for personnel that developed the LRA, and quality practices used by the applicant to develop the LRA. Additionally, the staff evaluated the quality attributes of the applicant’s aging management program activities described in Appendix A, “Final Safety Analysis Report Supplement,” and Appendix B, “Aging Management Programs and Activities,” of the LRA. The staff reviewed scoping and screening results reports for the main steam system (MSS), emergency core cooling system (ECCS), and the nuclear service cooling water tower (NSCW) to ensure that the applicant had appropriately implemented the methodology outlined in the administrative controls and that the results were consistent with the current licensing basis (CLB) documentation.

2.1.3.1 Implementation Procedures and Documentation Sources Used for Scoping and Screening

The staff reviewed the applicant's scoping and screening implementation procedures as documented in the Scoping and Screening Methodology audit report, dated March 17, 2008 (ML080640502), to verify that the process used to identify 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 process used by the applicant to ensure that CLB commitments were appropriately considered and that the applicant had adequately implemented the procedural guidance during the scoping and screening process.

2.1.3.1.1 Technical Information in the Application

LRA Section 2.1, “Scoping and Screening Methodology,” states that the applicant reviewed the following information sources during the license renewal scoping and screening process:

- Design Criteria Documents
- Update Final Safety Analysis Report (UFSAR)
- Plant drawings
- Maintenance Rule Scoping Documents
- Technical Specifications and Bases
- Safety Evaluation Reports
- Equipment Databases
- Master List of Environmental Qualification (EQ) Equipment
- Station Blackout (SBO) Analysis Report
- Licensing correspondence
- Vendor documents

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.

2.1.3.1.2 Staff Evaluation

<u>Scoping and Screening Implementation Procedures</u> The staff reviewed the applicant’s scoping and screening methodology implementation procedures, including license renewal guidelines, documents, reports, and AMR reports, as documented in the audit report, to ensure the guidance was consistent with the requirements of the Rule, the SRP-LR and the NEI 95-10. The staff finds the overall process used to implement the 10 CFR 54 requirements described in the implementing documents and AMRs was consistent with the

Rule and industry guidance. Guidance for determining plant SSCs within the scope of the Rule, and for determining which component types of the SCs, within the scope of license renewal, were subject to an AMR, were contained in the applicant's implementing documents.

During the review of the implementing documents, the staff focused on the consistency of the detailed procedural guidance with information in the LRA, including the implementation of NRC staff guidance documented in SRP-LR, and the information in request for addition information (RAI) responses dated February 27, 2008.

After reviewing the LRA and supporting documentation, the staff finds that the scoping and screening methodology instructions were consistent with Section 2.1 of the LRA. The applicant's methodology contained sufficient detail to provide concise guidance on the scoping and screening implementation process to be followed during the LRA activities.

<u>Sources of Current Licensing Basis Information</u> The staff reviewed the scope and depth of the applicant's CLB review to verify that the methodology was sufficiently comprehensive to identify SSCs within the scope of license renewal, as well as component types requiring an AMR. As defined in 10 CFR 54.3(a), the CLB is the set of NRC requirements applicable to a specific plant and a applicant's written commitments for ensuring compliance with, and operation within, applicable NRC requirements and the plant-specific design bases that are docketed and in effect. The CLB includes certain NRC regulations, orders, license conditions, exemptions, Technical Specifications, design-basis information documented in the most recent UFSAR, and applicant's commitments remaining in effect that were made in docketed licensing correspondence such as applicant responses to NRC bulletins, generic letters, and enforcement actions, as well as applicant commitments documented in NRC safety evaluations or licensee event reports.

During the audit, the staff reviewed pertinent information sources utilized by the applicant that included the UFSAR, license renewal boundary diagrams, 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, design criteria documents, Technical Specifications and bases, safety evaluation reports, equipment databases, the EQ master list, SBO analysis report, licensing correspondence, piping and instrumentation drawings (P&IDs), plant layout drawings, and vendor documents. The staff verified that the applicant's detailed license renewal program guidelines required use of the CLB source information in developing scoping evaluations.

The VEGP Design Criteria DC-1000-G and the Maintenance Rule list of systems were the applicant's primary repository for system identification and classification information. During the audit, the staff reviewed the applicant's administrative controls for the VEGP design criteria, maintenance rule information and other information sources used to verify system information. 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 system identification and classification information contained in the applicable VEGP documentation, the NRC staff concluded that the applicant had established adequate measures to control the integrity and reliability of VEGP system identification and classification data, and therefore, the staff concludes that the information sources used by VEGP during the scoping and screening process provided a sufficiently controlled source of system and 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 concludes that Section 2.1 of the LRA provided a description of the CLB and related documents used during the scoping and screening process that is consistent with the guidance contained in the SRP-LR. In addition, the staff reviewed the implementing procedures and results reports used to support identification of SSCs relied upon to demonstrate compliance with the safety-related criteria, nonsafety-related criteria and the regulated events criteria referenced in 10 CFR 54.4(a). The applicant’s license renewal program guidelines provided a comprehensive listing of documents used to support scoping and screening evaluations. The staff finds these design documentation sources to be useful for ensuring that the initial scope of SSCs identified by the applicant was consistent with the plants CLB.

2.1.3.1.3 Conclusion

On the basis of a review of information provided in Section 2.1 of the LRA, a review of the applicant's 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 considered CLB information consistent with the SRP-LR and 10 CFR 54 and is therefore 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 used in the LRA were adequately implemented. Although the applicant did not develop the LRA under a 10 CFR 50, Appendix B, QA program, the applicant applied the following quality assurance (QA) processes during the LRA development:

- The applicant developed written procedures to govern the implementation of the scoping and screening methodology.
- The applicant incorporated lessons learned from prior license renewal applications. Previous NRC requests for additional information were also reviewed to ensure that applicable issues were addressed.
- The applicant used a review system to verify and validate the controlling documents.
- The LRA was reviewed by the applicant’s on-site and corporate personnel and industry peers, prior to submittal to the NRC.
- The applicant’s QA organization performed an internal audit as an independent review of the LRA. The purpose of the audit was to ensure that

the license renewal documents, procedures and technical information were developed in accordance with the requirements of 10 CFR 54.4.

2.1.3.2.2 Conclusion

The staff reviewed reports, LRA development guidance, and discussed the quality controls applied to the LRA development with the applicant's license renewal staff. The staff concludes that the quality assurance activities met current regulatory requirements and provided additional assurance that LRA development activities were performed consistently with the applicant's LRA program requirements.

2.1.3.3 Training

2.1.3.3.1 Staff Evaluation

The staff reviewed the applicant's training process to ensure the guidelines and methodology for the scoping and screening activities would be performed in a consistent and appropriate manner. The license renewal scoping and screening activities and LRA development were accomplished by the applicant's corporate staff and VEGP site staff.

The applicant's training process provided both instruction and written guidance documents to the personnel involved with LRA development in order to ensure that the personnel had an understanding of the license renewal procedures, industry guidance and regulations applicable to the scoping and screening activities and LRA development. The applicant developed a checklist used as a tracking system as a basis for the personnel training record which listed the completed training sessions and the documents reviewed. Both corporate and site license renewal personnel were also qualified in plant support which focused on core plant training and how to support the plant in license renewal. In addition, the applicant provided training on design modification, plant support, components and systems in the mechanical, electrical and civil disciplines. The applicant developed technical training in scoping and screening methodology to establish the necessary knowledge and understanding of the license renewal process and the terminology used to support the license renewal review. The applicant's management and staff also participated in industry groups and task forces.

2.1.3.3.2 Conclusion

The staff reviewed completed qualification and training records and completed checklists of several of the applicant's license renewal personnel and concluded that the records adequately documented the training for the applicant's staff. Additionally, based on discussions with the applicant's license renewal personnel, the staff concludes that personnel were knowledgeable regarding the license renewal process requirements and the specific technical issues within their areas of responsibility.

2.1.3.4 Scoping and Screening Program Review Conclusion

On the basis of a review of information provided in Section 2.1 of the LRA, a review of the applicant's detailed scoping and screening implementation procedures, discussions with the applicant's license renewal personnel and the results from the scoping and screening audit, the staff concludes that the applicant's scoping and screening program was consistent with the SRP-LR and 10 CFR 54 and is therefore acceptable.

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

In LRA Section 2.1, the applicant described the methodology used to scope SSCs pursuant to the requirements of the 10 CFR 54.4(a) scoping criteria. The applicant described the scoping process for the plant in terms of systems and structures. Specifically, the scoping process consisted of developing a list of plant systems and structures, identifying their intended functions, and determining which functions meet one or more of the three criteria of 10 CFR 54.4(a). The systems list was developed using design criteria and maintenance rule system information. Additional information on mechanical system functions was obtained from the UFSAR, plant layout drawings and P&IDs. Structural functions were identified using UFSAR, the maintenance rule basis documents for structures, the plant seismic categorization information, and structural drawings. All electrical and I&C systems, and electrical and I&C components in mechanical systems, were included within in the scope of license renewal.

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

2.1.4.1.1 Technical Information in the Application

LRA Section 2.1.2.1, "10 CFR 54.4(a)(1) - Safety-Related," describes the scoping methodology as it relates to the safety-related criterion in accordance with 10 CFR 54.4(a)(1). With respect to the safety-related criterion, the applicant stated that the safety-related systems and structures are initially identified based on a review of the VEGP project classification designators (VEGP UFSAR Section 3.2.2.1) which are used in the plant documentation, the safety design bases discussions in the design criteria documents, the safety evaluation discussions in the UFSAR, and the safety-related determination results for the Maintenance Rule scoping. Systems and structures whose intended functions met one or more of the criteria in 10 CFR 54.4(a)(1) were included within the scope of license renewal. The applicant confirmed that all plant conditions, including conditions of normal operation, design basis accidents, external events, and natural phenomena for which the plant must be designed, were considered for license renewal scoping under 10 CFR 54.4(a)(1) criteria.

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 the following functions: (i) the integrity of the reactor coolant pressure boundary; (ii) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (iii) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or Part 100.11 of the Code of Federal Regulations.

With regard to identification of DBEs, Section 2.1.3, "Review Procedures," of the SRP-LR 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 defined in 10 CFR 50.49(b)(1)) to ensure the functions described in 10 CFR 54.4(a)(1).

During the audit the applicant stated that it evaluated the types of events listed in NEI 95-10 (i.e., anticipated operational occurrences, design basis accidents, external events and natural phenomena) that were applicable to VEGP. The applicant identified the documents that described the events, which are contained in the UFSAR and system design criteria which discussed events such as internal and external flooding tornados, and missiles. The applicant also reviewed licensing correspondence and design criteria. The staff concludes that the applicant's evaluation of DBEs was consistent with the SRP-LR.

The applicant performed scoping of SSCs for the 54.4(a)(1) criterion in accordance with the license renewal implementing documents 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 the implementing 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 personnel who were responsible for these evaluations.

The staff reviewed the applicant's evaluation of the rule and CLB definitions pertaining to 10 CFR 54.4(a)(1) and concluded that the VEGP CLB definition of safety-related did not contain references to 10 CFR 50.34 or 10 CFR 50.67(b)(2) as specified in the Rule. The applicant's definition of safety-related and exceptions to the definition in the Rule are documented in LRA Section 2.1.2.1. Based on this review, the staff verified that 10 CFR 50.34(a)(1) is not applicable to VEGP, Units 1 or 2, as it concerns applicants for a construction permit. The staff concludes that 10 CFR 50.67(b)(2), which concerns the use of an alternate source term in the dose analysis, is not applicable to VEGP, Units 1 or 2, which has not applied for the use of an alternate source term.

The staff reviewed a sample of the license renewal scoping results for the MSS, ECCS, and the NSCW tower to provide additional assurance that the applicant adequately implemented their scoping methodology with respect to 10 CFR 54.4(a)(1). The staff verified 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 verified 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.

The staff concludes that additional information would be required to complete the review of the applicant's scoping methodology. RAI 2.1-1, dated January 28, 2008, stated that during the NRC audit, the staff noted that source documents used to identify the SSCs which met the scoping criteria of 10 CFR 54.4(a)(1), including the VEGP updated safety analysis report Section 3.2, and procedures AP 05-007, Section 6.1.4, and AP 23M-001, Section 4.17.1, had differing definitions of safety-related and also cited superseded regulatory text in establishing the scoping criteria to be used in identifying VEGP SSCs in accordance with 10 CFR 54.4(a)(1) requirements. Therefore, the staff requested that the applicant provide a written evaluation that addresses the impact, if any, of the use of differing definitions of safety-related.

In the response to RAI 2.1-1 dated February 27, 2008, the applicant stated,

> "The VEGP definition of safety related for current design activities is defined in procedure ENG-016 which reads:
>
> Any structure, system, component, or part used in a nuclear power plant that is relied upon during or following design basis events to assure
>
> - The integrity of the reactor coolant pressure boundary,
> - The capability to shut down the reactor and maintain it in safe shutdown condition, or
> - The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR 100.11."

As noted in the question, wording in historic procedures has not always been section specific, but the intent and application was consistent. The CLB classification of VEGP SSCs was based on design criteria documents. The applicant's governing procedure for creation of these documents (PS-VS-001) was the primary source of the wording discrepancy in that it defined safety related as:

> Equipment, components, or structures perform a safety-related function if that function is required to:
>
> - Maintain the integrity of the reactor coolant pressure boundary.
> - Shut down the plant and maintain the plant in a safe shutdown condition.
> - Prevent accidents or mitigate their consequences.

This definition could not be used without further clarification because it did not define which accidents or consequences had been considered. However, the staff understood that this paragraph referred to accidents defined by limits in 10 CFR 100. This inference was demonstrated in the applicant's procedure (DC-1010), which was the section of the design manual that defined the safety classification of the VEGP SSCs. This section defined safety related as:

> Systems, structures, and components important to safety are defined as those items necessary to ensure:
>
> - The integrity of the reactor coolant pressure boundary.
> - The capability to shut down the reactor and maintain it in a safe shutdown condition.

- The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guideline exposures of 10 CFR 100.

While this reference does not include the specific section (10 CFR 100.11), the section of the 10 CFR 100 that defined “potential off site exposures” during initial classification of VEGP SSCs was Section 11. Therefore, the CLB definition of safety related SSCs for VEGP has been consistently applied and meets the criteria of 10 CFR 54.4(a)(1). (As noted in the VEGP LRA, 10 CFR 50.34(1)(1) and 10 CFR 50.67(b)(2) do not apply to VEGP).

The staff reviewed the applicant’s response to RAI 2.1-1 and determined that the applicant had provided a description of an adequate process used to ensure that SSCs had been appropriately included within the scope of license renewal, in accordance with 10 CFR 54.4(a)(1) and that the definitions for safety-related used to classify SSCs, as described in the response to RAI 2.1-1, was consistent with 10 CFR 54.4(a)(1).

2.1.4.1.3 Conclusion

On the basis of a review of systems sampled, discussions with the applicant, review of the applicant's scoping process, and the applicant’s response to RAI 2.1-1, the staff concludes that the applicant's methodology for identifying systems and structures is consistent with the SRP-LR and 10 CFR 54.4(a)(1), and is therefore acceptable.

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

2.1.4.2.1 Technical Information in the Application

LRA Section 2.1.2.2, “10 CFR 54.4(a)(2) - Nonsafety-Related SSCs Affecting Safety-Related SSCs,” the applicant described the scoping methodology as it related to the nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2). Also, the applicant’s 10 CFR 54.4(a)(2) scoping methodology was based on guidance provided in Appendix F of NEI 95-10, Rev. 6. The applicant evaluated the impacts of nonsafety-related SSCs that met 10 CFR 54.4(a)(2) criteria by considering functional failures and physical failures.

<u>Functional Failure of Nonsafety-Related SSCs</u> LRA 2.1.2.2.1, “Nonsafety-Related SSCs That Perform A Required Function In Support Of Safety-Related Functions,” stated that SSCs required to perform a function in support of safety-related components are generally classified as safety-related and are included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1).

For the few exceptions where nonsafety-related components are required to remain functional to support a safety function, this system intended function was identified and the components were included within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(2).

<u>Nonsafety-Related SSCs directly connected to Safety-Related SSCs</u> LRA 2.1.2.2.2, “Nonsafety- Related SSCs Directly Connected To Safety-Related SSCs and Relied Upon For Structural Support Of Safety-Related SSCs,” stated that nonsafety-related piping and supports are included within the scope of license renewal up to and including the seismic anchor as identified in the stress analysis, or to an equivalent anchor, or one of the other

methods provided for in NEI 95-10, Appendix F. The LRA defined equivalent anchor as a combination of restraints or supports such that the nonsafety-related piping and associated SCs attached to safety-related piping is included in scope up to a boundary point that encompasses two (2) supports (restraints) in each of the three (3) orthogonal directions. The other methods used to define a scoping boundary included bounding conditions discussed in NEI 95-10, including ending at a base mounted component, flexible connection, or to include the entire piping run.

<u>Nonsafety-Related SSCs With the Potential for Spatial Interaction With Safety-Related SSCs</u> LRA 2.1.2.2.3, "Nonsafety-Related SSCs Whose Failure Could Result In a Potential Spatial Interaction with Safety-Related SSCs That Could Prevent Accomplishment of a Safety Function," stated that nonsafety-related systems and nonsafety-related portions of safety-related systems are identified as in scope under 10 CFR 54.4(a)(2) if there is a potential for spatial interactions with safety-related equipment. Spatial failures were defined as failures of nonsafety-related SSCs that are located in the vicinity of safety-related SSCs creating the potential for interaction between the SSCs due to physical impact, pipe whip, jet impingement, a harsh environment resulting from a piping rupture, or damage due to leakage or spray that could impede or prevent the accomplishment of the safety-related functions of a safety-related SSC. Also included were nonsafety-related SSCs which provide protection from temperature extremes, or detect flooding and leaks. Mitigative features, such as missile barriers, flood barriers, and spray shields, were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). In addition, the preventive option described in Appendix F of NEI 95-10 was used to determine the scope of license renewal with respect to the protection of safety-related SSCs from spatial interactions that are not addressed in the CLB. This scoping process required an evaluation based on equipment location and the related SSCs and if fluid-filled system components are located in the same space as safety-related equipment. A "space" was defined as barriers composed of walls, floors and ceilings which prevented interaction between safety-related and nonsafety-related SSCs.

2.1.4.2.2 Staff Evaluation

Pursuant to 10 CFR 54.4(a)(2), the applicant must consider all nonsafety-related SSCs whose failure could prevent satisfactory accomplishment of safety-related SSCs relied upon to remain functional during and following a DBE to ensure the following functions: (i) the integrity of the reactor coolant pressure boundary; (ii) the capability to shut down the reactor and maintain it in a safe shutdown condition; or (iii) the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to those referred to in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11.

NRC Regulatory Guide 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses," Revision 1, (Reg Guide 1.188) provided NRC endorsement of the use of NEI 95-10, Revision 6, which discusses in Appendix F, the NRC staff position on 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 preventative options related to nonsafety-related and safety-related SSCs interactions.

In addition, the NRC staff position (as discussed NEI 95-10, Rev. 6) states that applicants should not consider hypothetical failures, but rather should base their evaluation on the plant's CLB, engineering judgment and analyses, and relevant operating experience. NEI 95-10 further describes operating experience as all documented plant-specific and industry-wide experience that can be used to determine the plausibility of a failure. Documentation would include NRC generic communications and event reports, plant-specific condition reports, industry reports such as safety operational event reports, and engineering evaluations. The staff reviewed LRA Section 2.1.2.2, where the applicant described the scoping methodology as it related to the application of the 10 CFR 54.4(a)(2) nonsafety-related criteria. In addition, the staff reviewed the applicant's results report which documented the guidance and corresponding results of the applicant's 10 CFR 5.4.4(a)(2) scoping review which had been performed in accordance with the guidance contained in NEI 95-10, Revision 6, Appendix F.

<u>Nonsafety-Related SSCs Required to Perform a Function that Supports a Safety-Related SSC</u> The staff concludes that nonsafety-related SSCs required to remain functional to support a safety-related function were included within the scope of license renewal as safety-related in accordance with the requirements of 10 CFR 54.4(a)(1) with several exceptions, which were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). This evaluating criteria was discussed in the applicant's 10 CFR 54.4(a)(2) report. The staff finds that the applicant implemented an acceptable method for scoping of nonsafety-related systems that perform a function that supports a safety-related intended function.

<u>Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs</u> The staff concludes that in order to identify the nonsafety-related SSCs connected to safety-related SSCs and required to be structurally sound to maintain the integrity of the safety-related SSCs, the applicant used a combination of the information contained in the VEGP structural analysis (to identify the structural boundary), equivalent anchors and the bounding approach as described in NEI 95-10, Appendix F. The applicant reviewed the safety-related to nonsafety-related interfaces for each mechanical system in order to identify the nonsafety-related components located between the interface and the structural boundary. The staff concludes that the applicant had included all nonsafety-related SSCs within the structural boundary within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

If a seismic support could not be located using the structural boundary, the applicant identified the portion of the nonsafety-related piping up to, and including, an equivalent anchor or a bounding condition such as a base-mounted component, flexible connection, or the end of the piping run, in accordance with the guidance of NEI 95-10, Appendix F, which was included within the scope of license renewal. The LRA and the applicant's implementing procedures defined an equivalent anchor as two supports in each of the three orthogonal directions.

<u>Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs</u> The applicant considered physical impact (pipe whip, jet impingement), harsh environments, flooding, spray, and leakage when evaluating the potential for spatial interactions between nonsafety-related systems and safety-related SSCs. The applicant used a "spaces approach" to identify the portions of nonsafety-related systems with the potential for 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, which was defined as a room or cubicle that is separated from other spaces by substantial objects (such as wall, floors, and ceilings).

Physical Impact or Flooding the applicant had considered situations where nonsafety-related supports for non-seismic piping systems with potential for spatial interaction with safety-related SSCs for inclusion within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The applicant had identified the nonsafety-related SSCs by performing a review of the UFSAR, CLB documents, industry guidance, equipment layout drawings, composite drawings, isometric drawings and by performing walkdowns. Piping and equipments supports and components were addressed in a commodity fashion within civil/structural AMR reports. The applicant's review of earthquake experience identified no occurrence of welded steel pipe segments falling due to a strong motion earthquake. The applicant concluded that as long as the effects of aging on supports for piping systems are managed, falling of piping systems is not credible (except due to flow accelerated corrosion as considered in the high energy line break (HELB) analysis for high energy systems) and the piping sections are not required to be included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) due to a physical impact hazard. The applicant evaluated the missiles that could be generated from internal or external events such as failure of rotating equipment. The nonsafety-related design features which protect safety-related SSCs from such missiles were included within the scope of license renewal. All nonsafety-related cranes, monorails and hoists (overhead-handling systems) were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) as structural commodities due to the potential for interaction with safety-related SSCs.

Pipe Whip, Jet Impingement, and Harsh Environment The applicant had evaluated nonsafety-related portions of high energy lines against the10 CFR 54.4(a)(2) criteria. The applicant's evaluation was based on a review of documents such as the UFSAR, design criteria documents and relevant site documentation. 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 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 within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) and subject to an AMR in order to provide assurance that those assumptions remain valid through the period of extended operation. Also, as discussed in the VEGP 10 54.4(a)(2) report, the applicant reviewed the reference documents, primarily the UFSAR and the VEGP Technical Requirements Manual, that contained HELB analysis for inside and outside containment and which identified high energy lines. Many of the identified systems were safety-related or required for a regulated event and included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The remaining nonsafety-related, high energy lines, which were determined to have the potential for interaction with safety-related SSCs, were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

Spray and Leakage The applicant evaluated moderate and low energy systems which have the potential for spatial interactions due to spray or 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 within the scope of license renewal. The applicant used a spaces approach to identify the nonsafety-related SSCs which were located within the same space as safety-related SSCs. As described in the LRA, a space was defined as barriers composed of walls, floors and ceilings which prevented interaction between safety-related and nonsafety-related SSCs. Following identification of the applicable mechanical systems, the applicant reviewed the system functions to determine whether the system contained fluid, air or gas. Based on plant and industry operating experience, the applicant excluded the nonsafety-related SSCs containing air or gas from the scope of license renewal with the exception of lines containing hydrogen gas whose failure were determined to have a potential impact on safety-related SSCs. The applicant then determined whether the system had any components located within a space containing safety-related SSCs. Those nonsafety-related SSCs determined to contain fluid or hydrogen gas, and located within a space containing safety-related SSCs, were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The staff concludes that additional information would be required to complete the review of the applicant's scoping methodology. During the on-site audit the staff reviewed the applicant's technical evaluation for nonsafety-related affecting safety-related SSCs which discussed the consideration of components located in the turbine building and identified as safety-related in the UFSAR. The applicant concluded in the technical evaluation that, although the turbine building contains components identified as safety-related in the UFSAR, these components are not vulnerable to the effects of a failure of nonsafety-related SSCs in the non-seismic areas within the limits of the CLB. Therefore, no additional SSCs located in the turbine building were included within the scope of license renewal based on the requirements of 10 CFR 54.4(a)(2). In RAI 2.1-2, dated January 28, 2008, the staff requested that the applicant provide the rationale and basis for not including nonsafety-related SSCs in the vicinity of safety-related SSCs in the turbine building within the scope of license renewal.

In the response to RAI 2.1-2 dated February 27, 2008, the applicant stated the following:

The following components in the turbine building are classified as safety related:

- Turbine impulse pressure transmitters
- Turbine steam bypass valve (steam dump valve) air supply solenoid valves
- High pressure turbine steam stop valve limit switches
- High pressure turbine steam control valve [electrohydraulic control] oil pressure transmitters and manual isolation valves

The applicant stated that although these components are conservatively classified as safety-related they (1) perform no safety function, (2) are not credited in the accident analysis, and (3) meet the VEGP CLB for preventing interactions from propagating back into the reactor protection system and they can not prevent satisfactory accomplishment of any of the safety related functions discussed in 10 CFR 54.4, paragraphs (a)(1) (i), (ii), or (iii). Based on the review of the functions of the components classified as safety related in the turbine building, the applicant determined that there were no nonsafety-related components located in the turbine building whose failure could prevent the performance of a safety-related function.

Therefore, no components located within the turbine building were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

The staff reviewed the applicant's response to RAI 2.1-2 and determined that the applicant had provided a description of an adequate process to review the functions of the components classified as safety-related and located in the turbine building. The staff concludes that the applicant had adequately performed and documented a review to determine that certain components located in the turbine building had been conservatively classified as safety-related although they did not perform a safety-function as defined in the CLB and, therefore, there were no nonsafety-related components located in the turbine building whose failure could prevent the performance of safety-related function.

Protective Features The applicant evaluated protective features such as whip restraints, spray shields, supports, missile and flood barriers installed to protect safety-related SSCs against spatial interaction with nonsafety-related SSCs due to fluid leakage, spray, or flooding. Such protective features credited in the plant design were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

2.1.4.2.3 Conclusion

On the basis of a review of the applicant's scoping process and sample systems, discussions with the applicant, and review of the information provided in the response to RAI 2.1-2, the staff concludes that the applicant's methodology for identifying and including nonsafety-related SSCs, which could affect the performance of a safety-related SSCs, within the scope of license renewal, is consistent with the scoping criteria of 10 CFR 54.4(a)(2), and is therefore acceptable.

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

LRA Section 2.1.2.3 , "10 CFR 54.4(a)(3) - Regulated Events," describes the methodology for identifying those systems and structures within the scope of license renewal in accordance with the Commission's criteria for five regulated events: (1) 10 CFR 50.48, "Fire Protection;" (2) 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants;" (3) 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events;" (4) 10 CFR 50.62, "Requirements for Reduction of Risk from Anticipated Transients Without Scram (ATWS) Events for Light-Water-Cooled Nuclear Power Plants;" and (5) 10 CFR 50.63, "Loss of All Alternating Current Power."

Fire Protection LRA Section 2.1.2.3.1, "10 CFR 50.48 - Fire Protection," described scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the fire protection criterion. The LRA stated the SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.48, "Fire Protection," were included in the scope of license renewal under the 10 CFR 54.4(a)(3) criterion.

The VEGP CLB documents applicable to the VEGP Fire Protection Program, such as the UFSAR Section 9.5.1 and Appendices 9A and 9B, were reviewed to determine the SSCs relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.48. Based on the CLB, the applicant included the SSCs credited with fire prevention, detection, and mitigation for areas containing equipment important to safety and for certain radioactive waste areas (as required by the CLB), within the scope of license renewal. The applicant also included in the scope of license renewal those SSCs relied upon in the CLB to maintain the ability to perform reactor plant safe shutdown functions in the event of a fire.

Environmental Qualification LRA Section 2.1.2.3.2, "10 CFR 50.49 - Environmental Qualification (EQ)," describes the scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function in compliance with the EQ criterion. The LRA stated that the master list of safety-related equipment located in a harsh environment (EQ master list) defines the electrical equipment subject to the requirements of 10 CFR 50.49.
The electrical components on the EQ master list have been included in the scope of license renewal in accordance with 10 CFR 54.4(a)(3).

Pressurized Thermal Shock LRA Section 2.1.2.3.3, "10 CFR 50.61 - Pressurized Thermal Shock (PTS)," describes the scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the PTS criterion. The LRA stated that SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," are within the scope of license renewal. Based upon a review of design basis documentation, only the reactor vessels and the reactor vessel internals credited to reduce fast neutron fluence are relied upon for protection against PTS. The reactor vessels and the reactor vessel internals structures credited to reduce fast neutron fluence have been included within the scope of license renewal for PTS in accordance with 10 CFR 54.4(a)(3).

Anticipated Transient Without Scram LRA Section 2.1.1.3.4, "Commission's Regulations for Anticipated Transients without Scram (10 CFR 50.62)," describes the scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the ATWS criterion. The LRA stated that the ATWS mitigation system actuation circuitry (AMSAC) was required to meet the 10 CFR 50.62 requirements. The AMSAC is described in UFSAR Section 7.7.1.11. The AMSAC and other SSCs relied on in analyses or plant evaluations to sense, initiate, and perform these required functions have been included within the scope of license renewal for ATWS in accordance with 10 CFR 54.4(a)(3).

Station Blackout LRA Section 2.1.1.3.5, "Commission's Regulations for Station Blackout (10 CFR 50.63)," describes the scoping of systems and structures relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the SBO criterion. The LRA stated that the functions relied upon during the SBO coping phase were described in UFSAR Section 8.4. The SSCs relied on in the analyses and plant evaluations for coping with an SBO event, and the systems containing these components, have been included within the scope of license renewal in accordance with 10 CFR 54.4(a)(3). In addition the SSCs required to recover from a SBO event were also included within the scope of license renewal in accordance with 10 CFR 50.63.

2.1.4.3.2 Staff Evaluation

The staff reviewed the applicant's approach to identifying mechanical systems and structures relied upon to perform functions meeting the requirements of the fire protection, EQ, PTS, ATWS, and SBO regulations. As part of this review the staff discussed the methodology with the applicant, reviewed the documentation developed to support the approach, and evaluated a sample of the mechanical systems and structures indicated as within the scope of license renewal under the 10 CFR 54.4(a)(3) criteria.

The applicant's implementing procedures describe the process for indentifying systems and structures within the scope of license renewal. The procedures state that all mechanical systems and structures that perform functions addressed in 10 CFR 54.4(a)(3) are to be included within the scope of license renewal and that the results are to be documented in scoping results reports.

The results reports reference the information sources used for determining the systems and structures credited for compliance with the regulated events.

<u>Fire Protection</u> The applicant's scoping results reports indicate that it considered CLB documents to identify in-scope systems and structures. These documents include the UFSAR, design criteria and fire protection P&IDs. The staff reviewed the scoping results reports in conjunction with the LRA and the CLB information to validate the methodology for including the appropriate SSCs within the scope of license renewal. The staff finds that the scoping results reports indicated which of the mechanical systems and structures are included within the scope of license renewal because they perform intended functions meeting 10 CFR 50.48 requirements. The staff concludes that the applicant's scoping methodology was adequate for including SSCs credited in performing fire protection functions.

<u>Environmental Qualification</u> The applicant had used the EQ master list to identify SSCs meeting the requirements of 10 CFR 50.49. The EQ master list included system information, component identification numbers and descriptions. The staff reviewed the LRA, implementing procedures, scoping results reports, and the EQ master list to verify that the applicant had identified SSCs within the scope of license renewal. The staff concludes that the applicant's scoping methodology was adequate for identifying EQ SSCs within the scope of license renewal.

<u>Pressurized Thermal Shock</u> The applicant addressed PTS requirements for these components in a TLAA report. The staff reviewed the TLAA report and scoping report and determined that the methodology is appropriate for identifying SSCs with functions credited for complying with the PTS regulation and within the scope of license renewal. For this requirement the applicant identified the reactor vessel and certain vessel internal components within the scope of license renewal.

<u>Anticipated Transient Without Scram</u> The applicant's scoping results report indicated the mechanical systems were included within the scope of license renewal because they perform intended functions meeting 10 CFR 50.62 requirements. The applicant determined the intended functions based on CLB information and identified most in-scope components as electrical equipment. For scoping electrical equipment, the applicant's bounding methodology included within the scope of license renewal all electrical and I&C systems in

mechanical systems by default. The applicant also included mechanical systems with ATWS intended functions based on CLB information. The staff concludes that this scoping methodology was adequate for identifying SSCs with functions credited for complying with the ATWS regulation.

Station Blackout The scoping results reports indicate the mechanical systems and structures credited with performing intended functions to comply with the SBO requirement. During the scoping process the applicant considered CLB information, including the UFSAR, design criteria, plant drawings and the SBO analysis report. The applicant included within the scope of license renewal electrical equipment, mechanical systems, and structures with intended functions meeting SBO requirements. For scoping electrical equipment, the applicant's bounding methodology included within the scope of license renewal all electrical and I&C systems by default. The mechanical systems and structures within the scope of license renewal are those relied on in the CLB for the SBO coping duration phase and for the SBO recovery phase. The staff concludes that this scoping methodology was adequate for identifying SSCs with functions credited for complying with the SBO regulation. The staff review and conclusion of the results of the implementation of the SBO scoping methodology is contained in Section 2.5.

2.1.4.3.3 Conclusion

The staff concludes 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. This conclusion is based on sample reviews, discussions with the applicant, and review of the applicant's scoping process as discussed above.

2.1.4.4 Plant-Level Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

System and Structure Level Scoping The applicant documented its methodology for performing the scoping of SSCs in accordance with 10 CFR 54.4(a) in the LRA, guidance documents and scoping and screening reports. The applicant's approach to system and structure scoping provided in the site guidance and implementing documents was consistent with the methodology described in Section 2.1 of the LRA. Specifically, the guidance documents specified that the personnel performing license renewal scoping use CLB documents and describe the system or structure, including a list of functions that the system or structure is required to accomplish. Sources of information included the UFSAR, design criteria, maintenance rule information, plant drawings, equipment databases 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). If any part of a system or structure met any of the license renewal scoping criteria, the system or structure was included in the scope of license renewal. The system and structure scoping results included an overall system/structure description, an evaluation of each of the 10 CFR 54.4 scoping criteria and the basis for the conclusion reached. The applicant developed evaluation boundaries to document the system and structure level scoping determinations and to define the in-scope SSCs to support the subsequent screening and AMR processes. The boundaries for the in-scope systems and structures were defined and documented in a manner for each discipline that assured the in-scope SSCs were included in the screening process.

Component Level Scoping After the applicant identified the intended functions of systems or structures within the scope of license renewal, a review was performed to determine which components and structures support the system's license renewal intended functions. The components that support intended functions were considered within the scope of license renewal and screened to determine if an AMR was required. The applicant considered three groups of SCs during this stage of the scoping methodology: (1) mechanical, (2) structural, and (3) electrical.

Commodity Groups Scoping The applicant applied commodity group scoping to structural and electrical SCs as discussed in Sections 2.1.4.6 and 2.1.4.7.

Insulation LRA Section 2.1.2.2.3 stated that insulation was included with the mechanical scoping. Piping insulation in containment penetrations was identified as being required to keep the local concrete temperatures below 200°F. Also, for certain HVAC systems, thermal insulation is credited in the calculations that assure that the HVAC systems will perform their safety-related functions. Insulation was included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

Consumables LRA Section 2.1.2.3, "Screening," discusses consumables. The information in Table 2.1-3 of the SRP-LR 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.

Group (a) Packing, gaskets, component mechanical seals, and O-rings are typically used to provide a leakproof seal when components are mechanically joined together. These items are commonly found in components such as valves, pumps, heat exchangers, ventilation units or ducts, and piping segments. Based on ANSI B31.1 and the ASME B&PV Code Section III, the subcomponents of these pressure retaining components are not pressure-retaining parts. Therefore, these subcomponents are not relied on to perform a pressure boundary intended function and were not subject to an AMR.

Group (b) Elastomers and other materials used as structural sealants are subject to an AMR if they are not periodically replaced and they perform an intended function, typically supporting a pressure boundary, flood barrier, or rated fire barrier. Compressible joints and seals, seismic joint filler, and roof membranes were included in the AMR of bulk commodities. Sealants with a pressure boundary function were included in the AMR of the containment buildings.

Group (c) Oil, grease, and component filters have been treated as consumables because either (1) they are periodically replaced or (2) they are monitored and replaced based on condition and were not subject to an AMR.

Group (d) Components such as system filters, fire hoses, fire extinguishers, self-contained breathing apparatus (SCBA), and SCBA cylinders are considered consumables and are routinely tested, inspected, and replaced when necessary. Periodic inspection procedures specify the replacement criterion of these components that are routinely checked by tests or inspections. Therefore, while these consumables are in the scope of license renewal, they are 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 systems and components within the scope of license renewal was documented in implementing procedures and scoping results reports for mechanical systems. The scoping process defined the plant in terms of systems and structures. Specifically, the implementing procedures 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 an intended function 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 documented the results of the plant-level scoping process in accordance with the guidance documents. The results were provided in the systems and structures documents and reports which contained information including a description of the structure or system, a listing of functions performed by the system or structure, 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 audit, the staff reviewed a sampling of the documents and reports and concluded that the applicant's scoping results contained an appropriate level of detail to document the scoping process.

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 methodology identifies SSC types, and commodity groups within the scope of license renewal and their intended functions in accordance with the requirements of 10 CFR 54.4.

2.1.4.5 *Mechanical Component Scoping*

2.1.4.5.1 Summary of Technical Information in the Application

In addition to the information previously discussed in Section 2.1.4.4.1, LRA Section 2.1.2 stated that for the mechanical scoping effort, summary-level boundary descriptions were developed, along with a set of license renewal mechanical boundary drawings. The mechanical boundary drawings were developed from the VEGP piping and instrumentation diagrams and show the mechanical components within the scope of license renewal, including those components that are only within the scope of license renewal in accordance with 10 CFR 54.4(a)(2), using color-coding. End points for the portions within the scope of license renewal were clearly delineated. Notes were added to the drawings as necessary to clarify the endpoints when they do not occur at a component or feature already depicted on the drawing.

2.1.4.5.2 Staff Evaluation

The staff evaluated LRA Section 2.1.2 and the guidance in the implementing project documents and reports to perform the review of mechanical scoping process. The project documents and reports provided instructions for identifying the evaluation boundaries. Determination of the mechanical system evaluation boundary required an understanding of system operations in support of intended functions.

This process was based on the review of design criteria documents, UFSAR, plant drawings, maintenance rule scoping documents, technical specifications and bases, safety evaluation reports, equipment databases, master list of EQ equipment, SBO analysis report, licensing correspondence, and vendor documents. The evaluation boundaries for mechanical systems were documented on license renewal boundary drawings that were created by marking mechanical piping and instrumentation diagrams to indicate the components within the scope of license renewal. Components within the evaluation boundary were reviewed to determine whether they perform an intended function. Intended functions were established based on whether a particular function of a component was necessary to support the system functions that meet the scoping criteria.

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 concludes that the applicant's proceduralized methodology was consistent with the description provided in the LRA Section 2.1 and the guidance contained in the SRP-LR, Section 2.1, and was adequately implemented.

The staff reviewed the applicant's methodology for identifying MSS and ECCS mechanical component types 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 verified that the applicant had identified and used pertinent engineering and licensing information in order to determine the MSS and ECCS mechanical component types required to be within the scope of license renewal. As part of the review process, the staff evaluated each system intended function identified for the MSS and ECCS, the basis for inclusion of the intended function, and the process used to identify each of the system component types. The staff verified that the applicant had identified and highlighted system P&IDs to develop the license renewal 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 verified that the applicant had independently verified 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, the systems sampled, and discussions with the applicant, the staff concludes that the applicant's methodology for identifying mechanical systems within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4.

2.1.4.6 *Structural Scoping*

2.1.4.6.1 Technical Information in the Application

In addition to the information previously discussed in Section 2.1.4.4.1, LRA Section 2.1.2 stated that the structural scoping effort, summary-level boundary descriptions were developed. Generally, the VEGP scoping process used a "spaces" approach in establishing the evaluation boundaries. With few exceptions, the scoping for a building or structure was the entire building. Individual license renewal drawings were not created for structures and were not necessary since the spaces approach was being used. A single boundary drawing based on the site plot plan drawing was created, however. This license renewal structural boundary drawing showed the in scope structures using color-coding, and displays the spatial relationship of the plant structures to one another.

2.1.4.6.2 Staff Evaluation

The staff reviewed the applicant's approach for identifying structures relied upon to perform the functions described in 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 within the scope of license renewal.

The applicant had identified and developed a list of plant structures and the structures intended functions through a review of design criteria documents, UFSAR, plant drawings, maintenance rule scoping documents, technical specifications and bases, safety evaluation reports, equipment databases, licensing correspondence, and vendor documents. Each structure was evaluated against the criteria of 10 CFR 54.4 (a)(1), (a)(2) and (a)(3).

The staff reviewed selected portions of the UFSAR, maintenance rule documents, design criteria, and structural drawings, implementing procedures and selected AMR reports to verify the adequacy of the methodology. In addition, staff reviewed the scoping results, including information contained in the source documentation, for the NSCW cooling tower building to verify that application of the methodology would provide the results as documented in the LRA. The staff reviewed the applicant's methodology for identifying structures 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 verified that the applicant had identified and used pertinent engineering and licensing information in order to determine the NSCW tower structure and components required to be within the scope of license renewal. As part of the review process, the staff evaluated the intended functions identified for the NSCW tower and components, the basis for inclusion of the intended function, and the process used to identify each of the component types. Additionally, the staff verified that the applicant had independently verified the results in accordance with the governing procedures.

2.1.4.6.3 Conclusion

Based on the staff's review of information in the LRA, scoping implementation procedures, and a sampling review of structural scoping results, the staff concludes that the applicant's methodology for identification of the structures within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4.

2.1.4.7 Electrical Component Scoping

2.1.4.7.1 Technical Information in the Application

LRA Section 2.1.2, states that for the electrical scoping effort, boundary drawings were not needed since the screening was performed using a "Plant-Wide Spaces Approach." LRA Section 2.5.1, "Plant-Wide Electrical," states that plant-wide electrical was the designation used by VEGP in the LRA for the sole purpose of grouping electrical components into one system grouping for scoping, screening, and an AMR. Identification of in-scope electrical and I&C components was performed on a generic component type basis. The electrical and I&C component types associated with the in-scope electrical and I&C systems and in-scope mechanical systems and civil structures, were also identified generically.

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA Sections 2.1.2 and 2.5.1 and the applicants implementing procedures and AMR reports that governed the electrical scoping methodology. The applicant had reviewed the electrical and I&C systems in accordance with the requirements of 10 CFR 54.4 and determined which systems were to be included within the scope of license renewal. During the scoping process, the applicant used the design criteria documents, UFSAR, plant drawings, maintenance rule scoping documents, technical specifications and bases, safety evaluation reports, equipment databases, master list of EQ equipment, SBO analysis report, licensing correspondence, and vendor documents.

All electrical and I&C components contained in plant systems and electrical systems contained in mechanical or structural systems were included within the scope of license renewal. The applicant reviewed fuse-holders using the plant fuse documentation and drawings and did not identify any fuse holders to be included within the scope of license renewal. The applicant reviewed the application of tie-wraps to determine if credit had been taken in the CLB for tie-wrap use or if nonsafety-related tie-wraps could affect a safety-related function, but did not identify any tie-wraps to be included within the scope of license renewal. The staff reviewed selected portions of the data sources and selected several examples of components for which the applicant demonstrated the process used to determine electrical components were within the scope of license renewal. The results of the staff's review of the implementation of the SBO scoping methodology is discussed in Section 2.5.

2.1.4.7.3 Conclusion

On the basis of the review of information contained in the LRA, scoping implementation procedures, and a sampling review of electrical scoping results, the staff concludes that the applicant's methodology for identification of electrical components within the scope of license renewal is in accordance with the requirements of 10 CFR 54.4.

2.1.4.8 *Scoping Methodology Conclusion*

On the basis of a review of the LRA and the scoping implementation procedures, the staff concludes that the applicant's scoping methodology is consistent with the guidance contained in the SRP-LR and identifies those SSCs (1) that are safety-related, (2) whose failure could affect safety-related functions, and (3) that are necessary to demonstrate compliance with the NRC's regulations for Fire Protection, Environmental Qualification, Pressurized Thermal Shock, Anticipated Transient Without Scram and Station Blackout. The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.4(a), and is therefore, acceptable.

2.1.5 Screening Methodology

2.1.5.1 *General Screening Methodology*

2.1.5.1.1 Technical Information in the Application

In LRA Section 2.1.3, "Screening Methodology," the applicant discussed the process for determining which components and structural elements require an AMR. Screening identifies SCs within the scope of license renewal that perform an intended function as described in 10 CFR 54.4, without moving parts or without a change in configuration or properties and that are not subject to replacement based on a qualified life or specified time period. The screening process determines the SCs subject to an AMR by:

- Listing the in-scope SCs by component type using the scoping results for a particular system or structure;
- "Screening" the component types for the passive and long-lived criteria; and
- Identifying the intended function(s) performed by the passive and long-lived SCs by component type for the in-scope system or structure.

The result was a tabulation of the in-scope passive long-lived SCs that perform intended functions and therefore require an AMR. The screening process grouped SCs into component groups (component types) based on similarity of design and purpose. Use of component groups enables evaluation of entire groups of SCs in a single screening evaluation. The screening process followed the recommendations of NEI 95-10. "Active" and "short-lived" determinations were made consistent with NEI 95-10. Components or structural elements that were either active or subject to replacement based on a qualified life were "screened out" as not subject to an AMR.

2.1.5.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21, each LRA must contain an Integrated Plant Assessment (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 under 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 components and electrical commodity groups within the scope of license renewal should be subject to an AMR. The applicant implemented a process for determining which SCs were subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). In LRA Section 2.1.3, 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 the component types and commodity groups, included within the scope of license renewal, to determine which ones were long-lived and passive and therefore subject to an AMR. The staff reviewed Section 2.3, Section 2.4, and Section 2.5 of the LRA 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 MSS and ECCS and the NSCW tower.

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

On the basis of a review of the LRA, the screening implementation procedures and a sampling of screening results, the staff concludes that the applicant's screening methodology was consistent with the guidance contained in the SRP-LR and was capable of identifying passive, long-lived components in-scope of license renewal that are subject to an AMR. The staff concludes that the applicant's process for determining which component types and commodity groups subject to an AMR is consistent with the requirements of 10 CFR 54.21.

2.1.5.2 *Mechanical Component Screening*

2.1.5.2.1 Summary of Technical Information in the Application

LRA Section 2.1.3.1, "Screening of Mechanical Systems," discusses 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. For mechanical systems, a systematic process was used to identify the components that require an AMR. The mechanical component screening included the following steps: (1) identifying the in-scope SCs and associated component types using the license renewal mechanical boundary information and drawings created during the scoping process; (2) evaluating the component types against the active/passive and long-lived/short-lived criteria of 10 CFR 54.21(a)(1)(i) and (ii); and (3) identifying the component intended functions for the passive and long-lived component types. For each system, the applicable component types for the components and component groups were identified and listed. The criteria of 10 CFR 54.21(a)(1)(i) and (ii) were applied to identify the passive long-lived component types. Component intended functions were also identified. The components that contribute to the performance of a system intended function, and perform their function without moving parts and without a change in configuration or properties, and are not subject to replacement based on a qualified life or specified time period were subject to an AMR.

2.1.5.2.2 Staff Evaluation

The staff evaluated the mechanical screening methodology discussed and documented in LRA Section 2.1.3.1, the implementing guidance documents, the AMR reports, and the license renewal drawings. The mechanical system screening process began with the results from the scoping process. The applicant reviewed each system evaluation boundary as illustrated on P&IDs to identify passive and long-lived components. Within the system evaluation boundaries, all passive, long-lived components that perform or support an intended function were subject to an AMR. The results of the review are documented in the AMR reports. The AMR reports contain information such as the information sources reviewed and the system intended functions.

The staff reviewed the results of the boundary evaluations and discussed the process with the applicant. The staff verified that mechanical system evaluation boundaries were established for each system within the scope of license renewal and that the boundaries were determined by mapping the system intended function boundary onto P&IDs. The applicant reviewed the components within the system intended function boundary to determine if the component supported the system intended function. Those components that supported the system intended function were reviewed to determine if the component was passive and long lived and therefore subject an AMR.

The staff reviewed selected portions of design criteria documents, UFSAR, plant drawings, maintenance rule scoping documents, and selected AMR reports. The staff conducted detailed discussions with the applicant's license renewal team and reviewed documentation pertinent to the screening process. The staff assessed if the mechanical screening methodology outlined in the LRA and procedures was appropriately implemented and if the scoping results were consistent with CLB requirements. The staff also reviewed the mechanical screening results for the MSS and ECCS to verify proper implementation of the screening process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.2.3 Conclusion

Based on its review of the LRA, the screening implementation procedures, and a sample of the MSS and ECCS screening results, the staff concludes 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 is in accordance with the requirements of 10 CFR 54.21(a)(1).

2.1.5.3 *Structural Component Screening*

2.1.5.3.1 Technical Information in the Application

LRA Section 2.1.3.2, “Screening of Structures,” states that the screening process was applied to in-scope buildings and civil structures to identify the structural elements to be evaluated in the AMRs. Screening evaluation boundaries were established based on the scoping boundary results. A “Component Supports and Bulk Commodities” screening evaluation boundary was also established to address common components within the in-scope structures. The scoping and screening process used a “spaces” approach in establishing the evaluation boundaries and with few exceptions, the scoping and screening boundary for a building or structure was the entire building. The listing of structural elements was facilitated by grouping components into component groups since structural components and commodities often do not have unique identifiers such as those given to mechanical components. Structural components and commodities were identified based on materials of construction and functional applications to categorize them for AMRs. A list of structural components and component groups was developed for each structural evaluation boundary. Since structures are inherently passive, and with few exceptions long-lived, the screening of structural components and commodities was based primarily on whether or not they perform an intended function.

Structural components that perform an intended function without moving parts and without a change in configuration or properties, and that are not subject to replacement based on a qualified life or specified time period were subject to an AMR.

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 within the scope of license renewal.

The staff reviewed the applicant’s methodology used for structural screening described in LRA Section 2.1.3.2 and in the applicant’s implementing guidance and AMR reports. The applicant had performed the screening review in accordance with the implementation guidance and captured pertinent structure design information, component, materials, environments, and aging effects. The staff verified that the applicant had determined that structures are inherently passive and long-lived, such that the screening of structural components and commodities was based primarily on whether they perform an intended function. Structural components were grouped as commodities based on materials of construction. The primary task performed by the applicant during the screening process was to evaluate structural components to identify intended functions as they relate to license renewal. 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 reviewed selected portions of the design criteria documents, UFSAR, plant drawings, maintenance rule scoping documents, structural drawings, implementing procedures and selected AMR reports. The staff conducted detailed discussions with the applicant's LR team and reviewed documentation pertinent to the screening process. The staff assessed if the screening methodology outlined in the LRA and procedures was appropriately implemented and if the scoping results were consistent with CLB requirements. The staff also reviewed structural screening results for the NSCW tower to verify proper implementation of the screening process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.3.3 Conclusion

On the basis of the staff's review of information contained in the LRA, the applicant's detailed screening implementation procedures, and a sampling review of structural screening results, the staff concludes that the applicant's methodology for identification of structural components within the scope of license renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1).

2.1.5.4 *Electrical Component Screening*

2.1.5.4.1 Technical Information in the Application

LRA Section 2.1.3.3 stated that VEGP used a "plant-wide spaces" approach for electrical and I&C screening. Electrical component types were screened on a plant-wide basis without regard to plant system. The spaces approach used was consistent with the approach described in NEI 95-10, Revision 6. A screening evaluation boundary was created which included all of the in-scope electrical and I&C systems, and the electrical and I&C portions of the in-scope mechanical systems. This plant-wide electrical boundary permitted the screening evaluation to be consolidated under one system boundary.

The electrical and I&C component types in use at VEGP were identified and listed. The listing provided by NEI 95-10 Appendix B, as well as plant-specific document reviews were the basis for this list. Electrical component types were organized into component groups. The electrical and I&C component groups were identified from a review of plant documents, drawings, equipment databases, and interface with the parallel mechanical and civil/structural screening efforts. Following the identification of the electrical and I&C component commodity groups, the "passive" screening criterion of 10 CFR 54.21(a)(1)(i) was applied to identify component groups that perform their intended function(s) without moving parts or without a change in configuration or properties. These passive components were identified utilizing the guidance of NEI 95-10 and the Electric Power Research Institute (EPRI) License Renewal Electrical Handbook.

The "short-lived" screening criterion of 10 CFR 54.21(a)(1)(ii) was then applied to those specific component groups that were not previously eliminated. The "short-lived" screening criterion found in 10 CFR 54.21(a)(1)(ii) excludes those components or commodity groups that are subject to replacement based on a qualified life or specific time period from the requirements of an AMR. Electrical components included in the plant EQ program are replaced on a specified interval based on a qualified life. Therefore, components in the EQ program do not meet the "long-lived" criteria of 10 CFR 54.21(a)(1)(ii) and are "short-lived" per the regulatory definition.

The passive component types that are not subject to replacement based on a qualified life or specified time period and were subject to an AMR were determined to include cables, connectors, fuse holders, and various switchyard components.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant's methodology used for electrical screening in LRA Sections 2.1.3.3 of the LRA and the applicant's implementation procedures and AMR 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 information contained in NEI 95-10, plant documents and drawings, the EQ master list, and the EPRI License Renewal Electrical Handbook as data sources to identify the electrical and I&C components.

The applicant identified two commodity groups which were determined to meet the passive criteria in accordance with NEI 95-10. The applicant evaluated the identified, passive commodities to identify whether they were subject to replacement based on a qualified life or specified time period (short-lived), or not subject to replacement based on a qualified life or specified time period (long-lived). The remaining passive, long lived components were determined to be subject to an AMR. The staff reviewed the screening of selected components to verify the correct implementation of the methodology.

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 concludes 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 concludes that the applicant's methodology for identification of electrical commodity groups within the scope of license renewal and subject to an AMR is in accordance with the requirements of 10 CFR 54.21(a)(1).

2.1.5.5 *Screening Methodology Conclusion*

On the basis of a review of the LRA, the screening implementation procedures, discussions with the applicant's staff, and a sample review of screening results, the staff concludes that the applicant's screening methodology was consistent with the guidance contained the SRP-LR and identified those passive, long-lived components within the scope of license renewal that are 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 is therefore acceptable.

2.1.6 Summary of Evaluation Findings

The staff review of the information presented in LRA Section 2.1, the supporting information in the scoping and screening implementation procedures and reports, the information presented during the scoping and screening methodology audit, and the applicant's responses to the staff's RAIs dated February 27, 2008, formed the basis of the staff's determination. The staff verified that the applicant's scoping and screening methodology was consistent with the requirements of the Rule. From this review, 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 is therefore acceptable.

2.1.7 References

1. LRA, Vogtle Electric Generating Plant, Units 1 and 2, dated June 29, 2007.

2. NUREG-1800, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," Revision 1, dated September 2005.

3. NEI 95-10, "Industry Guideline for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule," Revision 6, dated September 2005.

4. Scoping and Screening Methodology audit Trip Report Regarding the Southern Nuclear Operating Company, Inc., License Renewal Application for the Vogtle Electric Generating Plant, Units 1 and 2, dated June 29, 2007.

2.2 Plant-Level Scoping Results

2.2.1. Technical Information in the Application

In LRA Table 2.2-1 the applicant listed plant mechanical systems, structural systems, and electrical and instrumentation and controls systems 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 defined by 10 CFR 54.

2.2.2 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 2.2-1, and 2.2-2 to confirm that there were no omissions of plant-level systems and structures within the scope of license renewal.

The staff concludes whether the applicant properly identified the systems and structures within the scope of license renewal in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 54.4. The staff reviewed selected systems and structures that the applicant identified as not 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."

The staff's review of LRA Section 2.2 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.

In RAI 2.2-1, dated January 28, 2008, the staff noted that the LRA Table 2.2-2 defines the circulating water (CW) system, System No. 1401, as not within the scope of license renewal. Similar plant designs have identified their CW systems as being within scope based on 10 CFR 54.4(a)(2). The applicant was asked to provide additional information to justify exclusion of the CW system with respect to the applicable requirements of 10 CFR 54.4(a).

In its response, dated February 27, 2008, the applicant stated:

> The CW system components are located entirely within the Turbine Building, or in outside areas remote from any safety related systems, structures, or components (SCs). The CW system is not attached to any safety related SCs. Refer to the answer to RAI 2.1-2 for discussion regarding non-safety related components in the Turbine Building. The Circulating Water System components in the outside areas are physically located such that there is no potential for interaction with a safety related SC. Therefore, the CW system is not in scope for the 10 CFR 54.4(a)(2) scoping criteria.

Based on its review, the staff finds the applicant's response to RAI 2.2-1 acceptable, because the applicant provided clarification as to why the CW system is not in scope with respect to the applicable requirement of 10 CFR 54.4(a); therefore, the staff's concern described in RAI 2.2-1 is resolved.

In RAI 2.2-2, dated January 28, 2008, the staff noted that LRA Table 2.2-2 defines the turbine plant closed cooling water system, System No. 1404, as not within the scope of license renewal. However, the turbine plant cooling water system (System No. 1405), LRA section 2.3.3.7, is identified as being within the scope of license renewal based on 10 CFR 54.4(a)(2). It appears these two systems are very similar. The applicant was asked to provide additional information to justify exclusion of the turbine plant closed cooling water system with respect to the applicable requirements of 10 CFR 54.4(a).

In its response, dated February 27, 2008, the applicant stated:

> The Turbine Plant Cooling Water System, System No. 1405, is in scope based on 10 CFR 54.4(a)(2) because it supplies cooling water to the CVCS Chiller, the Steam Generator Blowdown Trim Heat Exchangers, and corrosion product monitors which are located in the Auxiliary Building. With certain exceptions based on location, those portions of the Turbine Plant Cooling Water System which are located in the Auxiliary Building are in scope for potential spatial interaction. … the Turbine Plant Cooling Water System components which are located in Room 124, the CVCS Chiller Pumps Room, are not in scope…There are no safety related components in Room 124, therefore, there is no potential for spatial interaction, so the components located in this room are not within the scope of license renewal for 10 CFR 54.4(a)(2).

> The Turbine Plant Closed Cooling Water System, System No. 1404, is not in scope based on 10 CFR 54.4(a)(2) because its components are located entirely within the Turbine Building. Refer to the answer to RAI 2.1-2 for discussion regarding non-safety related components in the Turbine Building.

Based on its review, the staff finds the applicant's response to RAI 2.2-2 acceptable, because the applicant provided clarification as to why the Turbine Plant Closed Cooling Water System is not in scope with respect to the applicable requirement of 10 CFR 54.4(a). Therefore, the staff's concern described in RAI 2.2-2 is resolved.

2.2.3 Conclusion

The staff reviewed LRA Section 2.2, 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 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 vessel, reactor vessel internals, and 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 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 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 are 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 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 delineated under 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions delineated under 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 delineated under 10 CFR 54.4(a), 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 described in 10 CFR 54.21(a)(1). For those meeting neither of these criteria, the staff sought to confirm that these SCs are 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.

<u>Two-Tier Scoping Review Process for Balance of Plant (BOP) Branch Systems</u>

There are 98 mechanical systems identified as within scope in the LRA, of which 51 systems are BOP systems. These 51 systems include most of the auxiliary systems and all the steam and power conversion systems. The staff performed a two-tier scoping review for the BOP systems.

A Tier 1 review is a less detailed review where the staff reviews the LRA and UFSAR to determine if the applicant failed to identify any component type that is typically found within the scope of license renewal. During this review the staff evaluated the system's function(s) described in the LRA and UFSAR to verify the applicant has not omitted from the scope of license renewal any component types with the intended functions delineated under 10 CFR 54.4(a).

A Tier 2 review is a detailed review of the LRA, UFSAR, and license renewal boundary drawings to determine if the applicant failed to identify any components within the scope of license renewal and any components subject to an AMR. During this review the staff evaluated the system's function(s) described in the LRA and UFSAR to verify the applicant did not omit from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviews those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive, long-lived components subject to an AMR in accordance with 10 CFR 54.21.

In determining the level of review (i.e., Tier 1 vs. Tier 2), the staff reviewed the LRA and the UFSAR description for each BOP system, focusing on the system's intended function(s). Tier 2 reviews were performed on systems that have:

- safety significance or risk significance
    - high safety significant systems
    - common cause failure of redundant trains
- operating experience indicating likely passive failure
- previous LRA experience

Examples of safety important or risk significant systems are the diesel generator (DG) and support systems and the emergency service water (ESW) system. An example of a system whose failure could result in common cause failure of redundant trains is a drain system providing flooding protection. Examples of systems with operating experience indicating likely passive failures include the main steam system (MSS), feedwater system, and service water system. Examples of systems with identified omissions in previous LRA reviews include spent fuel cooling system and makeup water sources to safety systems.

2.3.1 Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System

LRA Section 2.3.1 identifies the reactor vessel, reactor vessel internals, and reactor coolant system (RCS) SCs subject to an AMR for license renewal. The applicant described the supporting SCs of the reactor vessel, internals, and RCS in the following LRA sections:

2.3.1.1	Reactor vessel
2.3.1.2	Reactor vessel internals
2.3.1.3	RCS and connected lines
2.3.1.4	Pressurizer
2.3.1.5	Steam generators

The reactor vessel, reactor vessel internals, and RCS contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the RCS potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RCS performs functions that support fire protection, PTS, SBO, and EQ.

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:

> The reactor vessel system boundary includes the reactor vessel and system portions, including the control rod drive mechanism pressure boundary components and pressure boundary components for both incore flux and core cooling monitoring instrumentation, effectively constituting a part of the reactor coolant pressure boundary. The cylindrical reactor vessel has a welded hemispherical bottom head and a hemispherical upper closure head and contains the core, core supporting structures, control rods, and other core parts addressed in the next section. The upper closure head has penetrations for control rod drive mechanisms (CRDMs), thermocouples, reactor vessel level instrumentation system instruments, and a head vent. The vessel shell has inlet and outlet nozzles in a horizontal plane just below the reactor vessel flange but above the top of the core. The bottom head has penetrations for connection and entry of nuclear incore instrumentation. Conduits extend from the nuclear incore instrumentation penetrations down through the concrete shield area and up to a thimble seal table. The conduits and seal table mechanical seals provide the pressure barrier between the reactor coolant and the containment atmosphere.

LRA Table 2.3.1.1 identifies reactor vessel component types within the scope of license renewal and subject to an AMR. The intended functions of the reactor vessel component types within the scope of license renewal include:

- pressure-retaining boundary

- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.1 and UFSAR Sections 5.3, 7.7.2.7, and 7.7.2.8 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.”

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In RAI- 2.3.1-1 dated January 28, 2008, the staff requested the applicant to verify that the "hold-down spring”, listed in LRA Table 2.3.1.2 is the same spring described in UFSAR 3.9.5.1.2, Upper Core Support Assembly, which restrains axial movements of the upper and lower core support assemblies. In its response dated February 27, 2008, the applicant verified the spring was the same. The staff finds this response acceptable because the components are included in-scope for license renewal.

2.3.1.1.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any SCs 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 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 consisting of the lower core support, the upper core support, and the incore instrumentation support structures and including the fuel and control rod drive assemblies. The reactor vessel internals support the core, maintain fuel alignment, limit fuel assembly movement, maintain alignment between fuel assemblies and CRDMs, direct coolant flow past the fuel elements and to the pressure vessel head, provide gamma and neutron shielding and provide guides for the incore instrumentation.

> The lower core support structure consists of the core barrel, the core baffle, the lower core plate and support columns, the neutron shield pads, and the

core support, which is welded to the core barrel. The lower core support structure is supported at its upper flange from a ledge in the reactor vessel and restrained at its lower end by a radial support system attached to the vessel wall. The upper core support structure consists of the upper support, the upper core plate, the support columns, and the guide tube assemblies. The incore instrumentation support structures consist of an upper system to convey and support thermocouples penetrating the vessel through the head and a lower system to convey and support flux thimble tubes penetrating the vessel through the bottom.

LRA Table 2.3.1.2 identifies reactor vessel internals component types within the scope of license renewal and subject to an AMR. The intended functions of the reactor vessel internals component types within the scope of license renewal include:

- reactor core support and orientation
- control rod assembly support, orientation, guidance, and protection
- passageway for the distribution of reactor coolant to the reactor core
- passageway for incore instrumentation support, guidance, and protection
- secondary core support to limit core support structure downward displacement
- reactor vessel gamma and neutron shielding

2.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.2 and UFSAR Section 3.9.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.2.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 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 System and Connected Lines

2.3.1.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1.3 describes the RCS and connected lines:

> The RCS consists of four similar heat transfer loops connected in parallel to the reactor pressure vessel. Each loop has a reactor coolant pump (RCP), steam generator, piping, and valves. In addition, the system includes a pressurizer, pressurizer relief and safety valves, the reactor vessel head vent system, interconnecting piping, reactor vessel level instrumentation system instruments, and instrumentation for operational control. The pressurizer and steam generators are addressed separately in following sections. All these components are located in the containment building. During operation, the RCS transfers the heat generated in the core to the steam generators that drive the turbine-generator. Borated demineralized water circulating in the RCS at a flow rate and temperature for reactor core thermal-hydraulic performance acts as a neutron moderator and reflector and as a solvent for the neutron absorber for chemical shim control. The design of the RCS pressure boundary that provides a barrier against the release of radioactivity generated within the reactor is for high integrity throughout the life of the plant.

The pressurizer controls RCS pressure by electrical heaters and water sprays that maintain water and steam at saturation conditions. Steam can be formed (by the heaters) or condensed (by the pressurizer spray) to minimize pressure variations due to contraction and expansion of the reactor coolant. Spring-loaded safety and power-operated relief valves of the pressurizer discharge from the RCS steam then piped to the pressurizer relief tank (pressurizer relief discharge system), mixed with quench water, condensed, and cooled.

LRA Table 2.3.1.3 identifies RCS and connected lines component types within the scope of license renewal and subject to an AMR. The intended functions of the reactor coolant system and connected lines component types within the scope of license renewal include:

- prevention of flame propagation from ignition of vent pipe vapors back to the source
- restriction of process flow
- pressure-retaining boundary

2.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.3 and UFSAR Section 7.7.2.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.3.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the reactor coolant system and connected lines 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).

2.3.1.4 Pressurizer

2.3.1.4.1 Summary of Technical Information in the Application

LRA Section 2.3.1.4 describes the pressurizer, which controls RCS pressure by maintaining water and steam in equilibrium by electrical heaters and coolant sprays. Steam can be formed or condensed to minimize pressure variations caused by contraction or expansion of the reactor coolant. The pressurizer upper head has spring-loaded safety and power-operated relief valves. The pressurizer is a vertical, cylindrical vessel with hemispherical top and bottom heads. Spray line nozzles and relief and safety valve connections are located in the top head.
The pressurizer surge line connects the pressurizer bottom nozzle to a reactor coolant hot leg.

Removable electric heaters are installed in the bottom head.

LRA Table 2.3.1.4 identifies pressurizer component types within the scope of license renewal and subject to an AMR. The intended functions of the pressurizer component types within the scope of license renewal include:

- pressure-retaining boundary

- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.1.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.4 and UFSAR Section 5.4.10 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.4.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the pressurizer 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).

2.3.1.5 Steam Generators

2.3.1.5.1 Summary of Technical Information in the Application

LRA Section 2.3.1.5 describes the steam generators, four installed in each unit, one in each reactor coolant loop. All steam generators are Westinghouse Model F, vertical U-tube steam generators with moisture-separating equipment. On the primary side, reactor coolant flows through the inverted U-tubes, entering and exiting through the nozzles in the hemispherical steam generator bottom head divided into inlet and outlet chambers by a vertical partition plate extending from the head to the tube sheet.

On the secondary side, feedwater flows directly into the annulus formed by the outer shell and tube bundle wrapper before entering the boiler section of the steam generator. The water and steam mixture then flows upward through the tube bundle and into the steam drum section. Centrifugal moisture separators, located above the tube bundle, remove most of the moisture entrained in the steam. Steam dryers further improve the steam quality.

LRA Table 2.3.1.5 identifies steam generators component types within the scope of license renewal and subject to an AMR. The intended functions of the steam generators component types within the scope of license renewal include:

- heat exchange between fluid media
- spray shield or curbs for flow direction
- Flow pattern or distribution provision
- restriction of process flow
- physical integrity maintenance to prevent generation of debris or loose parts which could interfere with a safety-related function
- pressure-retaining boundary

- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.1.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.5 and UFSAR Section 5.4.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.5.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the steam generators 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

LRA Section 2.3.2 identifies the engineered safety features SCs subject to an AMR for license renewal.

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

- Containment Spray System
- Emergency Core Cooling Systems
- Containment Isolation Systems

2.3.2.1 Containment Spray System

2.3.2.1.1 Summary of Technical Information in the Application

LRA Section 2.3.2.1 describes the containment spray system, which provides borated water for removing decay heat and iodine from the containment atmosphere in post-accident conditions. The system consists of two trains, each with a pump, spray ring header and spray nozzles, valves, and connecting piping. Baskets with trisodium phosphate located on the containment floor control post-accident sump pH by mixing with the recirculating borated water. Containment emergency sumps located in containment collect borated water to provide suction to the containment spray pumps for recirculation after initial injection.

Water from the refueling water storage tank (RWST) provides suction to the containment spray pumps for initial injection. At the latter stages of the injection phase, operators initiate a manual switch-over to recirculation in which the containment spray pumps take suction from the containment emergency sumps. Each sump has a suction strainer to prevent debris from entering the containment spray system, which is designed to operate over an extended period of time in environmental conditions following a reactor coolant system failure.

The containment spray system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the containment spray system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the containment spray system performs functions that support EQ.

LRA Table 2.3.2.1 identifies containment spray system component types within the scope of license renewal and subject to an AMR:

- capillary tubing (sealed) for Containment (CTMT) pressure sensors
- closure bolting
- eductors - CTMT spray
- encapsulation vessels
- flow orifice/elements
- motor coolers - CTMT spray pumps (channel heads)
- motor coolers - CTMT spray pumps (shells)
- motor coolers - CTMT spray pumps (tubes)
- motor coolers - CTMT spray pumps (tubesheets)
- piping components
- piping components - pipe spools for startup strainers
- pump casings - CTMT spray pumps
- spray nozzles
- tank - spray additive tank (Unit 2 only)
- valve bodies

The intended functions of the containment spray system component types within the scope of license renewal include:

- heat exchange between fluid media
- flow pattern or distribution provision
- pressure-retaining boundary
- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.2.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.1 and UFSAR Section 6.2.2.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.2.1.3 Conclusion

The staff reviewed the LRA, UFSAR and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the containment spray 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 Emergency Core Cooling Systems

2.3.2.2.1 Summary of Technical Information in the Application

LRA Section 2.3.2.2 describes the ECCS, which include the safety injection system, safety injection portion of the chemical volume and control system (CVCS), and residual heat removal (RHR) system. The primary ECCS function following an accident is removal of the stored and fission product decay heat from the reactor core. The ECCS consists of passive injection by the safety injection accumulators, high-head active injection by the centrifugal charging and safety injection pumps, and low-head injection by the RHR pumps. Long-term recirculation and cooling of ECCS is by RHR pumps and heat exchangers.

The RWST supplies emergency borated cooling water to the high-head safety injection, low-head safety injection, and containment spray during the injection mode. The RWST is designed to hold enough dilute boric acid solution to fill the refueling canal prior to refueling operations and to provide injection water to support the safety injection system. The RWST also can fill the refueling cavity via the refueling water purification pump.

The safety-injection system consists of two safety-injection pumps, four accumulators, piping, and valves. The system provides post-accident, high-head and portions of low-head safety injection for emergency core cooling to limit core damage and fission product release for adequate shutdown margin and includes passive injection of coolant via the safety injection accumulators.

The RHR system consists of two trains of one pump, one heat exchanger, piping, and valves. The system transfers heat from the RCS to the NSCW via the component cooling water system to reduce reactor coolant temperature to the cold shutdown level at a controlled rate during the second part of normal plant cooldown and maintains this temperature until the plant starts up again. During RCS low-temperature operation, RHR system relief valves in the RHR pump suction lines mitigate RCS overpressure transients. RHR system portions also serve as ECCS parts for accident mitigation. Following a loss-of-coolant accident (LOCA) the RHR system is aligned initially to take suction from the RWST and inject into the RCS if RCS pressure is low enough for low-head safety injection. When the ECCS switches from the injection to the recirculation phase, the RHR pumps take suction from the containment emergency sumps and recirculate sump borated water to the RCS at low pressure or provide suction to the safety-injection and charging pumps for high-head recirculation. Each containment emergency sump has a strainer to prevent debris from entering the ECCS.

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

LRA Table 2.3.2.2 identifies ECCS component types within the scope of license renewal and subject to an AMR. The intended functions of the ECCS component types within the scope of license renewal include:

- heat exchange between fluid media
- restriction of process flow
- pressure-retaining boundary
- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.2.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.2 and UFSAR Sections 5.2.2.10, 5.4.7, 6.2.2, and 6.3 using the evaluation methodology described in Safety Evaluation Report (SER) Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In RAI 2.3.2.2-1, dated January 28, 2008, the staff requested additional information on the ECCS sump screens, which were designed in LRA Drawings 1X4LD122 and 131 as not in-scope components. The applicant responded that the ECCS sump screens are in scope components. They are categorized as structural components. Refer to LRA section 2.4.1, Table 2.4.1, and Table 3.5.2-1, Item 12. The staff finds this response acceptable because the components are included in-scope for license renewal.

The staff also requested that the applicant verify the LRA status of the boron injection surge tank because the tank is listed as an ECCS component in UFSAR Table 6.3.2-4. In its response dated February 27, 2008, the applicant responded that the boron injection surge tank on Unit 1 has been retired in place. Since it has no functions and is empty it is not in scope (refer to boundary drawing 1X4LD119). A boron injection surge tank was never installed on Unit 2 (refer to boundary drawing 2X4LD119).

The staff also requested that the applicant verify the status of the boric acid batching tank. In LRA Drawing 1X4LD118, the tank is highlighted but not listed in Table 2.3.2.2 or discussed in text. The applicant responded that the boric acid batching tanks are in scope components. These tanks are listed in LRA Table 3.3.2-10, Items 38a & 38b. The staff finds this response acceptable because the components are included in-scope for license renewal.

The staff also requested that the applicant verify the status of portions of the RWST liner. In LRA Table 2.3.2.2, the RWST tank liner is listed. In UFSAR 6.3.2.2.9; the tank is described as reinforced concrete tank with a stainless steel liner.

The applicant responded that the RWST tank liner is categorized as a mechanical component and is listed in LRA Table 2.3.2.2, Item 32.

As discussed in LRA section 2.3.2.2, the concrete shell, roof, and base slab which provide structural support for the tank liner are evaluated in the Structural scoping for the Concrete Tank and Valve House Structures, Section 2.4.7. The staff finds this response acceptable because the components are included in-scope for license renewal.

2.3.2.2.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the ECCS 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 Containment Isolation System

2.3.2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.2.3 describes the containment isolation system, an engineered safety feature that allows appropriate process fluids to pass through the containment boundary during normal and accident conditions while isolating containment barrier penetrations as required to preserve containment barrier integrity during accident conditions to prevent uncontrolled or unmonitored leakage of radioactive materials to the environment. The containment isolation system is not completely independent. Each piping system which penetrates the containment has containment isolation features which minimize the release of fission products following a design-basis accident. These features are scoped and evaluated in their respective mechanical process systems rather than in the containment isolation system.

2.3.2.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.3 and UFSAR Sections 6.2.4, and 15.6.5.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.2.3.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the containment isolation 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 Auxiliary Systems

LRA Section 2.3.3 identifies the auxiliary systems SCs subject to an AMR for license renewal.

The applicant described the supporting SCs of the auxiliary systems in the following LRA sections: (NOTE: Systems marked with "*" are Balance of Plant systems)

LRA Section	System
2.3.3.1*	new fuel storage
2.3.3.1*	spent fuel storage
2.3.3.2*	spent fuel cooling and purification system
2.3.3.3*	containment building polar bridge crane
2.3.3.3*	fuel handling & RV servicing equipment
2.3.3.3*	spent fuel cask bridge crane
2.3.3.4*	nuclear service cooling water
2.3.3.4*	nuclear service cooling water chemical injection
2.3.3.5*	component cooling water
2.3.3.6*	auxiliary component cooling water
2.3.3.7*	turbine plant cooling water
2.3.3.8*	river intake structure
2.3.3.9*	instrument air
2.3.3.9*	instrument, service, and breathing air
2.3.3.10*	boron recycle
2.3.3.10*	CVCS (non-ECCS portions)
2.3.3.10	CVCS (non-ECCS portions)
2.3.3.11	CB control room area HVAC
2.3.3.11	CB safety feature electrical equipment room HVAC
2.3.3.11	CB wing area, levels A, B, 1 and 2 normal HVAC

2.3.3.11	CB lab hood and laboratory area ventilation
2.3.3.11	CB locker and toilet exhaust
2.3.3.11	CB cable spreading rooms HVAC
2.3.3.11	electrical penetration filter exhaust
2.3.3.11	TSC HVAC
2.3.3.12	AB outside air supply and normal HVAC
2.3.3.12	AB radwaste area filter exhaust and continuous exhaust
2.3.3.12	AB engineered safety features room coolers
2.3.3.12	piping penetration filter exhaust
2.3.3.13	containment building air cooling
2.3.3.13	CTB lower level air circulation
2.3.3.13	CTB preaccess filter
2.3.3.13	CTB minipurge supply and normal preaccess purge supply
2.3.3.13	CTB minipurge exhaust and normal access purge exhaust
2.3.3.13	CTB post LOCA purge exhaust
2.3.3.13	CTB cavity cooling
2.3.3.13	CTB reactor support cooling
2.3.3.13	CTB auxiliary air cooling
2.3.3.13	CTB post-LOCA cavity purge
2.3.3.14	FHB normal HVAC
2.3.3.14	FHB post-accident exhaust
2.3.3.15	ventilation system - diesel generator building
2.3.3.16	ventilation system - auxiliary feedwater pump house
2.3.3.17	electrical tunnel ventilation
2.3.3.17	piping penetration ventilation
2.3.3.17	fire protection facilities HVAC
2.3.3.18	ventilation systems - radwaste buildings
2.3.3.19	fire protection water
2.3.3.19	fire protection seismic category I water
2.3.3.19	fire protection halon
2.3.3.20*	emergency diesel generator system
2.3.3.21*	demineralized water system
2.3.3.22	hydrogen recombiner and monitoring
2.3.3.23*	auxiliary building drain system – nonradioactive
2.3.3.23*	auxiliary building flood-retaining rooms, alarms, and drains
2.3.3.23*	containment and auxiliary building drain system – radioactive
2.3.3.23*	control building drains
2.3.3.23*	fuel handling building drains
2.3.3.23*	sanitary waste and vent
2.3.3.23*	turbine building drain
2.3.3.24*	potable water
2.3.3.24*	utility water
2.3.3.25*	radiation monitoring system
2.3.3.26*	reactor makeup water storage tank and degasifier
2.3.3.27*	nuclear sampling system – gaseous
2.3.3.27*	nuclear sampling system – liquids
2.3.3.27*	post-accident sampling
2.3.3.27*	turbine plant sampling
2.3.3.28*	auxiliary gas system – H2
2.3.3.28*	auxiliary gas system – N2

2.3.3.29* essential chilled water
2.3.3.29* normal chilled water
2.3.3.29* special chilled water
2.3.3.30* backflushable filter
2.3.3.30* condensate cleanup
2.3.3.30* waste processing system, gas
2.3.3.30* waste processing system, liquid
2.3.3.31 thermal insulation
2.3.3.32* miscellaneous leak detection

In accordance with Section 2.3, "Scoping and Screening Results – Mechanical Systems," the staff identified the following BOP systems for Tier 1 reviews:

LRA Section	System
2.3.3.23	sanitary waste and vent
2.3.3.23	turbine building drain system
2.3.3.24	potable water
2.3.3.24	utility water
2.3.3.28	auxiliary gas system – H2
2.3.3.30	backflushable filter system
2.3.3.30	condensate cleanup system

As part of the staff's review, the following RAIs identified instances of drawing errors where the continuation notation for piping on one drawing to another drawing was incorrect:

- RAI 2.3.3.4-4
- RAI 2.3.3.4-5
- RAI 2.3.3.6-1
- RAI 2.3.3.6-2
- RAI 2.3.3.23-1
- RAI 2.3.3.26-1

In its response, dated February 27, 2008, the applicant identified the correct locations.

Based on its review, the staff finds the applicant's responses to these RAIs acceptable because the applicant provided the correct drawing continuation references. Therefore, the staff's concerns described in the RAIs are resolved.
The staff's findings for the auxiliary systems are discussed below.

2.3.3.1 Fuel Storage Racks – New and Spent Fuel

2.3.3.1.1 Summary of Technical Information in the Application

LRA Section 2.3.3.1 describes the fuel storage racks for new and spent fuel. The fuel handling building houses the new fuel storage area and the spent fuel pool. The new fuel storage area houses new fuel storage racks for temporary dry storage of new fuel assemblies. Each rack is composed of individual vertical cells that can be fastened together in any number to form a module that can be bolted firmly to anchors in the floor of the new fuel storage area. The new fuel storage rack design includes storage for 162 fuel assemblies at a center-to-center spacing of 21 inches for minimal separation between adjacent fuel assemblies of 12 inches, sufficient to maintain a subcritical array even when the building is flooded with unborated water or during any DBE.

Spent fuel is stored in high-density racks. Each rack in the Unit 1 spent fuel pool consists of several cells welded together to form the rack top grid and at the bottom to a supporting grid structure. The Unit 2 spent fuel pool consists of an assemblage of cells interconnected along their contiguous corners in a honeycomb cellular structure. None of these free-standing modules are anchored to the floor or braced to the wall. The design of the racks with the soluble boron in the fuel storage pool is relied upon to keep the stored fuel subcritical for all analyzed events as described in the UFSAR. There are storage locations for 1476 assemblies in the Unit 1 pool and 2098 in the Unit 2 pool.

The fuel storage racks - new and spent fuel contain safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.3.3.1 identifies fuel storage racks - new and spent fuel component types within the scope of license renewal and subject to an AMR:

- failed fuel rod storage basket
- new fuel storage rack assembly
- spent fuel storage racks

The intended functions of the fuel storage racks - new and spent fuel component types within the scope of license renewal include:

- reactivity control
- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.1 and UFSAR Sections 4.3.2.6.1 and 9.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.1.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the fuel storage racks - new and spent fuel 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 Spent Fuel Cooling and Purification System

2.3.3.2.1 Summary of Technical Information in the Application

LRA Section 2.3.3.2 describes the spent fuel cooling and purification system, which removes decay heat generated by spent fuel assemblies stored in the spent fuel pool and which can maintain water clarity and purity in the spent fuel pool, the fuel transfer canal, the refueling cavity, and the RWST.

The spent fuel cooling and purification system consists of two cooling trains, each with one heat exchanger and pump, piping, and valves. One purification loop, with demineralizer, filter, piping, valving, and instrumentation, services both cooling loops. There is also a surface skimmer loop. Each cooling train is designed to maintain spent fuel pool temperatures and heat loads as described in the UFSAR.

The spent fuel cooling and purification system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the spent fuel cooling and purification system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the spent fuel cooling and purification system performs functions that support EQ.

LRA Table 2.3.3.2 identifies spent fuel cooling and purification system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- demineralizer vessels
- flow orifice/elements
- heat exchangers - SFP HXs (channel heads)
- heat exchangers - SFP HXs (shells)
- heat exchangers - SFP HXs (tubes)
- heat exchangers - SFP HXs (tubesheets)
- piping components
- piping components - piping spools for startup strainers
- pump casings - refuel water purification pumps
- pump casings - SFP pumps
- pump casings - SFP skimmer pumps
- strainer elements
- strainer housings
- valve bodies

The intended functions of the spent fuel cooling and purification system component types within the scope of license renewal include:

- protection from debris

- heat exchange between fluid media
- pressure-retaining boundary

2.3.3.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.2 and UFSAR Section 9.1.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.2.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the spent fuel cooling and purification 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 Overhead Heavy and Refueling Load Handling System

2.3.3.3.1 Summary of Technical Information in the Application

LRA Section 2.3.3.3 describes the overhead heavy and refueling load handling system, which includes the containment building (reactor) polar bridge crane, spent fuel cask bridge crane, and fuel handling and reactor vessel servicing equipment.

The containment building (reactor) polar bridge crane is a steel double-box girder, electric, overhead, top-running, motorized bridge crane with a 134-foot span mounted on a circular runway rail supported by the containment building superstructure. The bridge consists of two asymmetrical, welded plate box girders with full-depth diaphragms held together by structural end tie girders. The primary function of the polar crane is hoisting as required for the reactor head and internals during refueling and servicing operations.

The crane's rated operational load capacity is based on the integrated reactor head, the heaviest refueling lift requirement.

The primary function of the spent fuel cask bridge crane is to transport spent fuel casks between the railcar loading and unloading area and the spent fuel storage area. The crane may be in use during normal plant operation or when the plant is shut down for refueling or maintenance. The crane is also for unpacking and transport new fuel to the new fuel pit and for construction and maintenance lifts as required in the fuel handling and auxiliary buildings.

Fuel handling and reactor vessel servicing equipment for core alterations (fuel shuffle and fuel movement, core unload and reload), the refueling machine in the containment building and the fuel handling machine bridge crane in the fuel handling building, are designed to protect against fuel damage during handling and transfer operations.

The overhead heavy and refueling load handling system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the overhead heavy and refueling load handling system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.3 identifies overhead heavy and refueling load handling system component types within the scope of license renewal and subject to an AMR:

- baseplates and anchors for attachment to structures, and retaining clips
- crane (including bridge & trolley) structural girders
- crane rails

2.3.3.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.3 and UFSAR Sections 9.1.4 and 9.1.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.3.3 Conclusion

The staff reviewed the LRA, and UFSAR to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the overhead heavy and refueling load handling 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 Nuclear Service Cooling Water Systems (NSCW)

2.3.3.4.1 Summary of Technical Information in the Application

LRA Section 2.3.3.4 describes the NSCW systems, which include the NSCW and the NSCW chemical injection systems. The NSCW system, composed of two redundant, completely independent, full-capacity flow trains, provides essential cooling to safety-related equipment and to some nonsafety-related auxiliary components. Each train has three 50-percent capacity vertical centrifugal pumps, one forced-draft cooling tower, piping, and valves. The system supplies cooling water for the containment coolers, control building essential chiller condensers, various engineered safety feature (ESF) pump coolers, standby diesel generator jacket water coolers, and the component cooling water (CCW) and auxiliary component cooling water (ACCW) heat exchangers.

The NSCW cooling towers, the ultimate heat sink for the plant, are required for safe shutdown. They remove heat from the NSCW system during normal operation, safe shutdown or cooldown of the reactor, or accident conditions. Each cooling tower consists of a basin which contains the ultimate heat sink water and of an upper structure which transfers the NSCW heat loads to the atmosphere. The upper structure is a vertical, circular, concrete mechanical draft tower with motor-driven fans for heat transfer to the atmosphere by direct contact of water droplets from spray manifolds with forced air flow.

The combined storage capacity of the two tower basins per unit meets short-term (30 days) storage requirements for the ultimate heat sink without makeup. The mechanical portion of the NSCW cooling towers includes the piping, valves, and mechanical draft fans.

The NSCW chemical injection system, which injects biocide, dispersant, and corrosion inhibitor solutions to the NSCW system to inhibit biological growth, prevent deposition of suspended solids, and reduce copper tube corrosion, is comprised of chemical injection pumps, chemical mixing and storage tanks, drums, or both, and piping components for transferring chemical solutions to the injection points downstream of the NSCW pumps at the NSCW cooling tower basins. The chemical injection equipment is located in the NSCW chemical control building.

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

LRA Table 2.3.3.4 identifies NSCW systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- oil coolers - NSCW pumps thrust bearings (coils)
- piping components
- pump casings - NSCW system pumps
- pump casings - NSCW transfer pumps
- spray nozzles
- valve bodies

The intended functions of the NSCW systems component types within the scope of license renewal include:

- heat exchange between fluid media
- flow pattern or distribution provision
- restriction of process flow
- pressure-retaining boundary

2.3.3.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.4 and UFSAR 9.2.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.4 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. In addition to the RAIs 2.3.3.4-4 and 2.3.3.4-5 related to drawing continuation errors described in Section 2.3.3, the applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.4-1, dated January 28, 2008, the staff noted that drawings 1X4LD133-1, 1X4LD133-2, 2X4LD133-1, and 2X4LD133-2, locations G-6, G-7, and G-8 show NSCW cooling tower fans as within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). However, the fan casings/housings are not included in LRA Table 2.3.3.4 as a component type subject to an AMR. The applicant was requested to provide additional information to explain why the NSCW tower fan casings/housings are not included in LRA Table 2.3.3.4 as component types subject to an AMR.

In its response, dated February 27, 2008, the applicant stated:

> The NSCW fan, composed of the motor driver, gearbox, shaft, hub assembly and blades, is an active assembly, not subject to an AMR. The stack that forms the fan's housing for flow direction control is constructed of concrete and is an integral part of the NSCW cooling tower structure. The housing is in scope and is included in Table 2.4.6 as NSCW cooling tower stack.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.4-1 acceptable because the applicant provided clarification that the fan housing in question is within the scope of license renewal and is included in Table 2.4.6 as part of the "NSCW cooling tower stack." Therefore, the staff's concern described in RAI 2.3.3.4-1 is resolved.

In RAI 2.3.3.4-2, dated January 28, 2008, the staff noted that drawings 1X4LD133-1 and 2X4LD133-1 (D-4) show pipe sections 131-1" and 130-1" and drawings 1X4LD133-2 and 2X4LD133-2 (D-4) show pipe sections 132-1" and 369-1" that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(2). None of these pipelines show in-scope anchoring that assures these pipelines are adequately anchored for spatial interaction. The applicant was requested to provide additional information explaining how the pipelines listed above are adequately anchored to prevent spatial interaction.

In its response, dated February 27, 2008, the applicant stated:

> The above pipe lines are in scope for attached or connected piping (10 CFR 54.4(a)(2)). In this case, attached piping bounds spatial interaction - the entire lines out to their termination points are in the scope of license renewal and are age managed. These lines terminate at either a blind flange or welded pipe cap and thus the (a)(2) concerns associated with them do not propagate into other systems or to other nonsafety-related segments of the NSCW system. As part of the plant's CLB, these lines are seismically analyzed and seismically supported, with the pipe supports being in the scope of license renewal and age managed. These segments of nonsafety-related piping cannot fail in a way that would compromise safety-related equipment, either by failure of attached piping or a pressure boundary breech resulting in a spatial interaction.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.4-2 acceptable because the applicant stated that the subject pipe sections, as part of the plant's CLB, are seismically analyzed and supported. Therefore, the staff’s concern described in RAI 2.3.3.4-2 is resolved.

In RAI 2.3.3.4-3, dated January 28, 2008, the staff noted that drawings 1X4LD133-1, 2X4LD133-1, 1X4LD133-2, and 2X4LD133-2 (D-4) show pipe sections 505-2", 057-2", 007-2", and 007-2", respectively, that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(2). None of these pipe sections show in-scope anchoring that assures these pipe sections are adequately anchored for spatial interaction. The applicant was requested to provide additional information explaining how these pipelines are adequately anchored to prevent spatial interaction.

In its response, dated February 27, 2008, the applicant stated:

> The above pipe lines are in scope for attached or connected piping (10 CFR 54.4(a)(2)). In this case, attached piping bounds spatial interaction - the entire lines out to their termination points are in the scope of license renewal and are age managed. These lines terminate at a blind flange and thus the (a)(2) concerns associated with them do not propagate into other systems or to other nonsafety-related segments of the NSCW system. As part of the plant's CLB, these lines are seismically analyzed and seismically supported, with the pipe supports being in the scope of license renewal and age managed. These segments of nonsafety-related piping cannot fail in a way that would compromise safety-related equipment, either by failure of attached piping or a pressure boundary breech resulting in a spatial interaction.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.4-3 acceptable because the applicant stated that the subject pipe sections, as part of the plant's CLB, are seismically analyzed and supported. Therefore, the staff’s concern described in RAI 2.3.3.4-3 is resolved.

2.3.3.4.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the nuclear service cooling 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).

2.3.3.5 Component Cooling Water System

2.3.3.5.1 Summary of Technical Information in the Application

LRA Section 2.3.3.5 describes the closed-loop CCW system as an intermediate heat transfer system between potentially radioactive heat sources and the NSCW system to reduce the probability of radioactive releases to the environment from a leaking component. The CCW system cools the spent fuel pool heat exchangers, the RHR heat exchangers, and the RHR pump seal coolers.

The CCW system, consisting of two redundant trains, each with one heat exchanger, three 50-percent centrifugal pumps, one surge tank, piping, and valves, is designed to operate at lower pressure than is the NSCW system to prevent potentially contaminated CCW water from entering the NSCW system, which is open to atmosphere through the NSCW cooling towers.

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

LRA Table 2.3.3.5 identifies CCW system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- heat exchangers - CCW HXs (channel heads)
- heat exchangers - CCW HXs (shells)
- heat exchangers - CCW HXs (tubes)
- heat exchangers - CCW HXs (tubesheets)
- motor coolers - CCW pumps (channel heads)
- motor coolers - CCW pumps (shells)
- motor coolers - CCW pumps (tubes)
- motor coolers - CCW pumps (tubesheets)
- piping components
- piping components - pipe spools for startup strainers
- pump casings - CCW pumps
- tanks - CCW chemical addition feeder tanks

- tanks - CCW surge tanks
- valve bodies

The intended functions of the CCW system component types within the scope of license renewal include:

- heat exchange between fluid media
- restriction of process flow
- pressure-retaining boundary

2.3.3.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.5 and UFSAR Section 9.2.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.5.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the CCW 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 Auxiliary Component Cooling Water System (1217)

2.3.3.6.1 Summary of Technical Information in the Application

LRA Section 2.3.3.6 describes the ACCW system, which removes heat from the heat exchangers and components that handle radioactive fluids necessary for normal plant startup, normal power operation, normal shutdown and cooldown, and refueling. Not essential for safe plant shutdown under accident conditions, the ACCW system is composed of two 100-percent capacity ACCW heat exchangers, two 100-percent capacity ACCW pumps, one ACCW surge tank, piping, and valves. The ACCW system accomplishes cooling through an intermediate closed-loop design cooled in turn by water directly from the NSCW system.

Because it may be contaminated by radioactive materials, the ACCW system is designed for lower pressures than those for the NSCW system, which is open to the atmosphere through the ultimate heat sink cooling towers, so the cooling systems do not release radioactive materials to the environment. The system cools the normal charging pump motor coolers, seal water heat exchanger, catalytic hydrogen recombiners, waste gas compressors, pressurizer sample coolers, reactor coolant sample cooler, reactor coolant drain tank heat exchanger, reactor coolant pump (RCP) motor coolers, thermal barriers, bearing lube oil coolers, letdown heat exchanger, excess letdown heat exchanger, and ACCW pump and motor coolers.

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

LRA Table 2.3.3.6 identifies ACCW system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- heat exchangers - ACCW HXs (channel heads)
- heat exchangers - ACCW HXs (shells)
- heat exchangers - ACCW HXs (tubes)
- heat exchangers - ACCW HXs (tubesheets)
- motor coolers - ACCW pumps (channel heads)
- motor coolers - ACCW pumps (shells)
- motor coolers - ACCW pumps (tubes)
- motor coolers - ACCW pumps (tubesheets)
- piping components
- piping components - pipe spools for startup strainers
- pump casings - ACCW pumps
- tanks - ACCW chemical addition feeder tanks
- tanks - ACCW surge tanks
- valve bodies

The intended functions of the ACCW system component types within the scope of license renewal include:

- restriction of process flow
- pressure-retaining boundary

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.6 and UFSAR Section 9.2.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.6 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. The staff identified RAIs 2.3.3.6-1 and 2.3.3.6-2 involving instances of drawing errors where continuation notation for the piping from one drawing to another drawing was incorrect. These are described in Section 2.3.3.

2.3.3.6.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the ACCW auxiliary component cooling 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).

2.3.3.7 Turbine Plant Cooling Water System

2.3.3.7.1 Summary of Technical Information in the Application

LRA Section 2.3.3.7 describes the turbine plant cooling water (TPCW) system, which supplies cooling water to remove heat from nonsafety-related heat exchangers: turbine plant closed-loop cooling water heat exchangers, main turbine lube oil coolers, normal cooling water system chillers, steam generator blowdown trim heat exchangers, CVCS chillers, generator hydrogen coolers, isophase bus coolers, vacuum pump seal water coolers, and generator stator coolers.

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

LRA Table 2.3.3.7 identifies TPCW system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- piping components
- strainer housings
- valve bodies

The intended function of the TPCW system component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.7 and UFSAR Section 9.2.11 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.7.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the TPCW 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).

2.3.3.8 River Intake Structure System

2.3.3.8.1 Summary of Technical Information in the Application

LRA Section 2.3.3.8 describes the river intake structure system, which provides makeup water to the circulating water system hyperbolic cooling towers and an alternate source of makeup to the NSCW cooling towers and dilutes the discharge of plant effluent as required to meet 10 CFR Part 20 limits.

The failure of nonsafety-related SCs in the river intake structure system could potentially prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.8 identifies river intake structure system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping components
- valve bodies

The intended function of the river intake structure system component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.8 and UFSAR Sections 10.4.5.2.2C and 10.4.5.2.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.8.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the river intake structure 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 Compressed Air System

2.3.3.9.1 Summary of Technical Information in the Application

LRA Section 2.3.3.9 describes the compressed air system, which continuously supplies filtered, dry, oil-free compressed air for pneumatic instrument operation and control of pneumatic actuators. The system also supplies compressed, normally filtered, dry, and oil-free service air to outlets throughout the plant for operation of pneumatic tools and for other service air requirements. There are one reciprocating compressor and two rotary compressor trains located in each unit. The outlets from the air receivers of these three trains for each unit connect to a common compressed air supply line. Piping for the third reciprocating compressor train located in Unit 1 can be aligned to either the Unit 1 or Unit 2 compressed air supply line.

The compressed air supply line in each unit branches to supply both the service air system and the instrument air system. The service air system consists of a prefilter, a dryer, and an after-filter from which the air flows to the various service air loops. The instrument air system consists of two dryers in parallel, each with a pre-filter and after-filter. The air from the system flows to the various instrument air loops in the unit.

The compressed air system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the compressed air system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the compressed air system performs functions that support EQ.

LRA Table 2.3.3.9 identifies compressed air system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- piping components
- valve bodies

The intended functions of the compressed air system component types within the scope of license renewal include:

- restriction of process flow
- pressure-retaining boundary

2.3.3.9.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.9 and UFSAR Section 9.3.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.9.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the compressed air 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 Chemical and Volume Control and Boron Recycle Systems

2.3.3.10.1 Summary of Technical Information in the Application

LRA Section 2.3.3.10 describes the CVCS and the boron recycle system. The CVCS maintains the required RCS inventory by regulating the programmed pressurizer water level through continuous charging and letdown of reactor coolant water for the control of water chemistry conditions, activity level, and soluble chemical neutron absorber concentration. The CVCS also injects seal water into the RCPs. Portions of the system contain borated water at a concentration higher than that of the RCS to maintain reactor shutdown margin.

The CVCS consists of one normal charging and two standby centrifugal charging pumps. The centrifugal charging pumps provide safety injection flow as described in LRA Section 2.3.2.2. In addition, the system has a letdown heat exchanger, an excess letdown heat exchanger, a regenerative heat exchanger, a volume control tank, piping, valves, and filters. The CVCS has demineralizer vessels and chemical tanks to control RCS water chemistry and the system recycles reactor grade water. Portions of the CVCS functioning as parts of the ECCS inject flow to the RCS during post-accident injection and recirculation. LRA Section 2.3.2.2 describes ECCS functions.

The CVCS boron recycle system portion processes reactor coolant effluent fit for reuse as makeup and decontaminates the effluent by demineralization. The CVCS thermal regeneration system portion is usable during reactor coolant boration and dilution operations, when RCS letdown flow may be directed to the thermal regeneration demineralizers to adjust reactor coolant boric acid concentration.

The CVCS and boron recycle systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the CVCS and boron recycle systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the CVCS and boron recycle systems perform functions that support fire protection, SBO, and EQ.

LRA Table 2.3.3.10 identifies CVCS and boron recycle systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- demineralizer vessels
- filter housings
- flow orifice/elements
- heat exchangers - excess letdown HXs (channel heads)
- heat exchangers - excess letdown HXs (shells)
- heat exchangers - excess letdown HXs (tubes and tubesheets)
- heat exchangers - letdown chillers (channel heads)
- heat exchangers - letdown chillers (shells)
- heat exchangers - letdown chillers (tubes)
- heat exchangers - letdown HXs (channel heads)
- heat exchangers - letdown HXs (shells)
- heat exchangers - letdown HXs (tubes and tubesheets)
- heat exchangers - letdown reheat HXs (channel heads)
- heat exchangers - letdown reheat HXs (shells)
- heat exchangers - letdown reheat HXs (tubes and tubesheets)
- heat exchangers - moderating HXs (channel heads)
- heat exchangers - moderating HXs (shells)
- heat exchangers - moderating HXs (tubes and tubesheets)
- heat exchangers - regenerative HXs (channel heads)
- heat exchangers - regenerative HXs (shells)
- heat exchangers - regenerative HXs (tubes and tubesheets)
- letdown orifices
- motor coolers - normal charging pumps (channel heads)
- motor coolers - normal charging pumps (shells)
- motor coolers - normal charging pumps (tubes)
- motor coolers - normal charging pumps (tubesheets
- piping components
- piping components - pipe spools for startup
- strainers
- pump casings - boric acid transfer pumps
- pump casings - CVCS recycle feed pumps
- pump casings - normal charging pumps
- pump casings - zinc addition injection pumps
- tank diaphragms - boric acid storage tanks
- tanks - boric acid batching tanks
- tanks - boric acid storage tanks
- tanks - boron meter tanks

- tanks - chemical mixing tanks
- tanks - recycle holdup tanks
- tanks - volume control tanks
- valve bodies

The intended functions of the CVCS and boron recycle systems component types within the scope of license renewal include:

- restriction of process flow
- physical integrity maintenance to prevent generation of debris or loose parts which could interfere with a safety-related function
- pressure-retaining boundary

2.3.3.10.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.10 and UFSAR Sections 9.3.4.1 and 9.3.4.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.10.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the CVCS and boron recycle 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 Ventilation Systems – Control Building

2.3.3.11.1 Summary of Technical Information in the Application

LRA Section 2.3.3.11 describes the control building ventilation systems, which include the following:

- control room area HVAC system
- control building safety feature electrical equipment room HVAC system
- control building wing area, levels A, B, 1, and 2 normal HVAC system
- control building lab hood and laboratory area ventilation system

- control building locker and toilet exhaust system
- control building cable spreading rooms HVAC system
- electrical penetration filter exhaust system
- onsite technical support center HVAC system

The control room area HVAC system operates in either normal or emergency mode. In the normal mode the system supplies conditioned air to the control room area during normal plant operating conditions for personnel comfort and a suitable operating environment for equipment.

If gaseous fission product levels exceed limits in the outside air intake, the control room HVAC system would be re-aligned from normal to emergency mode where a small amount of outside air filtered by high-efficiency filtration units maintains a control room envelope pressurization. The system also switches to the emergency mode upon a safety injection signal or manual actuation. The four safety-related filtration units have train-related cooling coils which take cooling water from the essential chilled water system. Both Units 1 and 2 share the control room emergency HVAC system, the air ducts serving the control room forming a common system connected to the safety-related air handling units.

The control building safety feature electrical equipment room HVAC system provides a proper environment and temperature for electrical equipment and maintenance personnel during normal and postulated accident conditions. During normal operations, cooling is by coils containing cooling water from the normal chilled water system. Under design-basis accident conditions, two cooling trains are by cooling coils with cooling water from the essential chilled water system. Power for each train of the system is from a separate and independent Class 1E power system. Continuous exhaust minimizes the accumulation of hydrogen gas within the battery rooms.

The control building wing area levels A, B, 1, and 2 normal HVAC system provides ventilation, cooling, heating, and smoke removal for operating personnel during normal conditions. Cooling coils contain cooling water from the normal chilled water system.

The control building laboratory hood and laboratory area ventilation system provides exhaust and auxiliary makeup airflow necessary for the proper operation of the laboratory hoods. The system also purges the laboratory area of airborne radioactive contamination. Air in the hoods and laboratory area pass through carbon filters before discharging to the atmosphere. Safety-related system components are limited to the tornado dampers and their ductwork.

The control building locker and toilet exhaust system purges the locker, shower, storage, toilet, and control building level 2 battery areas by exhausting to the atmosphere the air supplied to these areas during normal operating conditions.

The control building cable spreading rooms HVAC system cools, heats, and ventilates the cable spreading, auxiliary relay, normal air-conditioning, electric equipment, and computer rooms during normal conditions. The system provision of emergency cooling to the auxiliary relay, normal air-conditioning, and electric equipment rooms is a safety-related function. These emergency cooling coils contain cooling water from the essential chilled water system. The other safety-related portions of this system are the tornado dampers and their ductwork.

The electrical penetration filter exhaust system fans and filtration units for Unit 1 were abandoned in place and never installed on Unit 2. Ductwork and dampers for this system are in use for normal ventilation.

The onsite technical support center HVAC system provides environmental control for habitability, supports computer operational requirements, and filters potentially radioactive particulates and iodine gas during normal and emergency plant operations. This system is not safety-related but has certain fire dampers within the scope of license renewal.

The control building ventilation systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the control building ventilation systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the control building ventilation systems perform functions that support fire protection and SBO.

LRA Table 2.3.3.11 identifies control building ventilation systems component types within the scope of license renewal and subject to an AMR:

- AC units (ESF) housings
- closure bolting
- control room filter and fan unit housings
- control room filter and fan unit moisture eliminators
- cooling coils (essential chilled water)
- cooling coils (normal chilled water)
- damper housings
- duct silencer housings
- ductwork and fittings
- fan housings
- flexible connectors
- heater housings
- piping components
- sealants

The intended functions of the control building ventilation systems component types within the scope of license renewal include:

- heat exchange between fluid media
- missile barrier
- moisture elimination or reduction
- pressure-retaining boundary

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.11 and UFSAR Sections 6.4, and 9.4.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.11.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the control building ventilation 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).

2.3.3.12 Ventilation Systems – Auxiliary Building

2.3.3.12.1 Summary of Technical Information in the Application

LRA Section 2.3.3.12 describes the auxiliary building ventilation systems, which include the following:

- auxiliary building outside air supply and normal HVAC
- auxiliary building radwaste area filter exhaust and continuous exhaust system
- auxiliary building ESF room coolers
- piping penetration filter exhaust system

The auxiliary building outside air supply and normal HVAC system provides the outside air required to maintain acceptable auxiliary building activity. The system also heats and cools the building to maintain acceptable temperatures during normal operation. This system works in conjunction with the auxiliary building radwaste area filter exhaust system, which filters and exhausts the air supply to maintain negative pressurization in the auxiliary building for radioactivity control. A containment isolation signal isolates the auxiliary building outside air supply and normal HVAC system from the building's penetration filter exhaust system.

The auxiliary building radwaste area filter exhaust and continuous exhaust system maintains negative pressure in the auxiliary building by exhausting from the building more air than is supplied so no unfiltered potentially contaminated air leaks to the environment. This system also exhausts air from the radwaste transfer building and radwaste transfer tunnel, filtering all exhaust air to collect any fission products before discharging it through the equipment building stack. A containment isolation signal isolates the auxiliary building radwaste area filter exhaust and continuous exhaust system from the auxiliary building penetration filter exhaust system.

The auxiliary building ESF room coolers cool safety-related switchgear, motor control centers, and pump rooms during normal, post-accident, and loss-of-offsite-power conditions. Each equipment room is cooled by a unit powered by the same safety features train as that for its equipment. Individual fan-coil units use train-related essential chilled water during such emergency conditions.

The safety-related piping penetration filter exhaust system minimizes the release to the outside atmosphere of airborne radioactivity from containment leakage into the piping penetration areas during accident conditions by exhausting air to maintain negative pressure in those areas and filtering the exhaust air to remove fission products before releasing it through the vent stack. A portion of the exhaust air passes through cooling coils and recirculates back to the piping penetration areas. A containment ventilation isolation signal isolates the piping penetration filter exhaust system from the normal auxiliary building supply and exhaust systems, energizing the piping penetration exhaust fan and filter. Cooling coils contain cooling water from the NSCW system.

The auxiliary building ventilation systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the auxiliary building ventilation systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the auxiliary building ventilation systems perform functions that support fire protection and EQ.

LRA Table 2.3.3.12 identifies auxiliary building ventilation systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- cooling coils (essential chilled water)
- cooling coils (normal chilled water)
- cooling coils (NSCW)
- damper housings
- ductwork and fittings
- fan housings
- flexible connectors
- piping components
- piping penetration area cooler housings
- piping penetration filter and fan unit housings
- piping penetration filter and fan unit moisture eliminators
- room cooler housings

The intended functions of the auxiliary building ventilation systems component types within the scope of license renewal include:

- heat exchange between fluid media
- missile barrier
- moisture elimination or reduction
- pressure-retaining boundary

2.3.3.12.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.12 and UFSAR Section 9.4.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3. During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In reviewing LRA Section 2.3.3.12, the staff identified areas in which additional information was necessary to complete the review of the results of the applicant's scoping and screening. Therefore, by letter dated January 28, 2008, the staff issued a request for additional information concerning the specific issues to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following paragraphs describe the staff's RAI and the applicant's related response.

In RAI 2.3.3.12-1, dated January 28, 2008, the staff identified several non-safety-related fans, not identified on the drawings as in-scope, but identified as being subject to an AMR. The Scope Determination Summary states that non-safety-related fan housings in this system are relied upon as missile barriers (for the fan element). Therefore, the staff requested the applicant to clarify whether these components are subject to aging management review.

<u>Applicant's Response and Staff's Evaluation</u>

In a letter dated February 27, 2008, the applicant stated:

> The fans are an airfoil design. The fan manufacturer asserts that the airfoil fan blade design used for these fans does not fail catastrophically in such a manner that a missile could be ejected. Therefore, the associated fan housings are not considered in scope under 10 CFR Part 54.4(a)(2) criterion as missile barriers.

The applicant also stated that the Scoping Determination Summary (Page 2.3-70) in the LRA will be revised to clarify that only certain fan housings perform a missile barrier function. Based on its review, the staff finds the applicant's response to RAI 2.3.3.12-1 acceptable.

2.3.3.12.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the auxiliary building ventilation 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).

2.3.3.13 Ventilation Systems – Containment Building

2.3.3.13.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13 describes the containment building (CTB) ventilation systems, which include the following:

- containment building air cooling system
- containment building lower level air circulating system
- containment building preaccess filter system
- containment building minipurge supply and normal preaccess purge supply systems
- containment building minipurge exhaust and normal preaccess purge exhaust systems
- containment building post-LOCA purge exhaust system
- containment building cavity cooling system
- containment building reactor support cooling system
- containment building auxiliary air cooling system
- containment building post-LOCA cavity purge system

The safety-related containment building air cooling system reduces the containment temperature and pressure following a LOCA or main streamline break accident inside containment by removing thermal energy. The system consists of eight air coolers per unit and their ductwork and dampers. The containment coolers are divided into two trains with four fan coolers each. Every cooler receives a start signal automatically upon a safety injection signal. The containment building air cooling system also detects reactor coolant leakage during normal operation. If air cooler condensate collected and measured in a standpipe rises above a preset level in the standpipe, a high condensate flow alarm annunciates in the control room.

The containment building lower level air circulating system mixes containment lower level air to prevent local hot spots. The system fans provide horizontal circulation in the area below the operating deck during normal operations.

The containment building preaccess filter system, with the normal purge system, controls airborne radioactivity inside containment.

This system circulates and filters containment air without makeup to reduce radioactivity in the containment atmosphere below the level required for personnel access for inspection, maintenance, and refueling operations.

The containment building minipurge supply and normal preaccess purge supply systems filter outside air to the containment atmosphere for adequate ventilation and personnel comfort while the plant is shut down and for reduction of airborne contaminants and control of pressure buildup inside containment during normal operations.

The containment building minipurge exhaust and normal preaccess purge exhaust systems support the containment building minipurge supply and normal preaccess purge supply systems with the necessary containment ventilation air exhaust and filtration. Air exhaust is through the plant vent.

The containment building post-LOCA purge exhaust system allows containment purging as a backup to the hydrogen recombiner system to maintain post-accident hydrogen concentration below the combustible level. Use of the system post-LOCA may be in conjunction with a portable air compressor through the seismic Category I portion of the service air piping to provide the purge motive force. The air removed through ducting in the containment dome area passes through the seismic Category I containment penetrations and the filter units where it exhausts through the vent stack.

The containment building cavity cooling system cools the reactor cavity. The containment building cavity cooling units operate with NSCW system cooling water in conjunction with the containment building air cooling system to cool the primary shield concrete and nuclear instrumentation. The system operates during normal and loss-of-offsite-power conditions. Upon loss of offsite power loading of the cooling fans is automatic on a bus energized by the diesel generator but the fans must be loaded manually following a LOCA. Safety-related portions of the system include the cooling coils and cavity pressure relief dampers. This system is also within the scope of license renewal under 10 CFR 54.4(a)(2) due to the missile barrier function of its fan housings.

The containment building reactor support cooling system operates in conjunction with the reactor cavity cooling system to cool the reactor supports. The containment building reactor support cooling fans exhaust air from the reactor vessel supports to keep the concrete within its operating temperature limit during normal and loss-of-offsite-power conditions.

The containment building auxiliary air cooling system removes excess thermal energy from the containment atmosphere due to heat losses from operating equipment during normal power generation and refueling outages. The system augments the containment cooling system cooling capacity by an amount equivalent to the heat lost from the CRDM unit fans. The system detects reactor coolant leakage during normal operation by collecting and measuring air cooler condensate in a standpipe.

The containment building post-LOCA cavity purge system prevents hydrogen pocketing in the reactor cavity after a LOCA by supplying air to the reactor cavity to maintain hydrogen concentration below the combustible level, a safety-related function. The system has a Class 1E power supply, each redundant train connected to separate safety buses.

The system meets seismic Category I criteria and starts automatically upon a safety injection signal.

The containment building ventilation systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the containment building ventilation systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the containment building ventilation systems perform functions that support EQ.

LRA Table 2.3.3.13 identifies containment building ventilation systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- cooling coils (NSCW)
- CTB aux cooling unit housings
- CTB cooling unit housings
- damper housings
- ductwork and fittings
- fan housings
- flexible connectors
- flow orifice/elements
- piping components
- valve bodies

The intended functions of the CTB ventilation systems component types within the scope of license renewal include:

- heat exchange between fluid media
- restriction of process flow
- missile barrier
- pressure-retaining boundary

2.3.3.13.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13 and UFSAR Sections 6.2.1, 6.2.2, 6.5.1, and 9.4.6 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In reviewing LRA Section 2.3.3.13, the staff identified areas in which additional information was necessary to complete the review of the results of the applicant’s scoping and screening. Therefore, by letter dated January 28, 2008, the staff issued a request for additional information concerning the specific issues to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1).

The following paragraphs describe the staff's RAI and the applicant's related response.

In RAI 2.3.3.13-1, dated January 28, 2008, the staff identified that the CRDM unit fans were not identified on the drawings as in-scope and being subject to an AMR when the applicant had indicated in other areas that the housings for some fans in the containment building are considered in scope under 10 CFR Part 54.4(a)(2) criterion as missile barriers. Therefore, the staff requested the applicant to clarify whether these components are subject to AMR, or justify their exclusion.

<u>Applicant's Response and Staff's Evaluation</u>

In a letter dated February 27, 2008, the applicant stated:

> The housings for the CRDM unit fans, 1(2)1509B7001 000 through 1(2) 1509B7004000, perform a missile barrier function in accordance with 10 CFR 54.4(a)(2) and should have been shown as in scope on boundary drawings 1X4LD214-1 and 2X4LD214-1. Therefore, Containment Building CRDM Cooling System will be removed from LRA Table 2.2-2, "Systems and Structures Not Within the Scope of License Renewal," and added to Table 2.2-1. A description of the system will also be added to the Auxiliary System Description in LRA Section 2.3.3.13. This system description will describe the basis for the Containment Building CRDM Cooling System meeting 10 CFR 54.4(a)(2) criterion.

The commodity type fan housings (ID No. 7d and 7e) in LRA Table 3.3.2-13 provide the AMR for these fan housings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the CRDM unit fan housings are within the scope of license renewal in accordance with 10 CFR 54.4(a), and are subject to an AMR in accordance with 10 CFR 54.21(a) (1).

2.3.3.13.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the containment building ventilation 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).

2.3.3.14 Ventilation Systems – Fuel Handling Building

2.3.3.14.1 Summary of Technical Information in the Application

LRA Section 2.3.3.14 describes the fuel-handling building ventilation systems, which include the fuel-handling building normal HVAC and fuel-handling building post-accident exhaust systems. The fuel-handling building normal HVAC system heats, cools, ventilates, and filters fuel-handling building (shared by Units 1 and 2) air to maintain an atmosphere suitable for personnel and equipment during normal operation. Redundant radiation monitors in the fuel-handling building normal exhaust ductwork detect high radiation levels. If radiation levels exceed setpoints, a signal isolates the fuel-handling building normal exhaust system and initiates the fuel-handling building post-accident exhaust system.

The fuel-handling building post-accident exhaust system prevents ex-filtration of contaminated air from the fuel-handling building by filtering and exhausting air from the area after its isolation from the normal fuel-handling building ventilation subsystem. The fuel-handling building post-accident exhaust system maintains a negative pressure within the area following a fuel-handling accident. The system consists of two 100-percent capacity exhaust filtration units, piping, ductwork, and dampers and shares the exhaust ductwork from the isolation dampers to the post-accident exhaust filtration units with the fuel-handling building normal HVAC system. If a fuel-handling accident releases radioactivity, radiation monitors in the normal fuel-handling building exhaust duct sense high radioactivity and transmit a high-radiation signal to the balance of plant safety actuation system, which in turn generates a fuel-handling building isolation signal which causes the isolation dampers to close, isolating the fuel-handling building from the normal supply and exhaust. The exhaust filtration units start automatically upon the isolation signal and duct the exhaust from the filtration units to the plant vent. The fuel-handling building post-accident exhaust system also can be actuated manually from the control room.

The fuel-handling building ventilation systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the fuel-handling building ventilation systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the fuel-handling building ventilation systems perform functions that support fire protection and EQ.

LRA Table 2.3.3.14 identifies fuel-handling building ventilation systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- cooling coils (normal chilled water)
- damper housings
- ductwork and fittings
- fan housings
- fuel-handling building post-accident filter and fan unit housings
- fuel-handling building post-accident filter and fan unit moisture eliminators
- flexible connectors
- piping components
- valve bodies

The intended functions of the fuel handling-building ventilation systems component types within the scope of license renewal include:

- missile barrier
- moisture elimination or reduction
- pressure-retaining boundary

2.3.3.14.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 9.4.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In reviewing LRA Section 2.3.3.13, the staff identified areas in which additional information was necessary to complete the review of the results of the applicant's scoping and screening. Therefore, by letter dated January 28, 2008, the staff issued a request for additional information concerning the specific issues to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following paragraphs describe the staff's RAIs and the applicant's related responses.

In RAI 2.3.3.14-1, dated January 28, 2008, the staff identified that the fuel handling building normal AC unit fans and fuel pool area recirculating air handling unit fans were not identified on the drawings as in-scope, but were identified as being subject to an AMR. The Scope Determination Summary states that non-safety-related fan housings associated with this system are relied upon as missile barriers (for the fan element). Therefore, the staff requested the applicant to clarify whether these components are subject to AMR.

Applicant's Response and Staff's Evaluation

In a letter dated February 27, 2008, the applicant stated:

> The fans are an airfoil design. The fan manufacturer asserts that the airfoil fan blade design used for these fans does not fail catastrophically in such a manner that a missile could be ejected. Therefore, the associated fan housings are not considered in scope under 10 CFR Part 54.4(a)(2) criterion as missile barriers.

The applicant also stated that the Scoping Determination Summary (Page 2.3-70) in the LRA will be revised to qualify that only certain fan housings perform a missile barrier function.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-1 acceptable.

In RAI 2.3.3.14-2, dated January 28, 2008, the staff concludes fuel pool area recirculating air handling system ductwork was not identified on the drawings as in-scope or being subject to an AMR. The Scope Determination Summary states that certain ductwork and dampers associated with the Fuel Handling Building Normal HVAC System interface with the Fuel Handling Building Post-Accident Exhaust System and must maintain integrity in order to maintain negative pressure in the Fuel Handling Building post-accident.

Therefore, the staff requested the applicant to clarify whether these components are in scope and subject to AMR.

Applicant's Response and Staff's Evaluation

In a letter dated February 27, 2008, the applicant stated:

> The ductwork from PASS 1-2702-P5-SAP does not perform an in-scope function. NEI95-10 Appendix F section 5.2.2.1 provides the basis for air and gas systems not being a hazard to other plant equipment. The failure of the non-safety related portion of ductwork is not a credible event which could impact the portion of duct that is in-scope for 10 CFR Part 54.4(a)(1). Therefore, the ductwork from PASS 1-2702-P5-SAP is not considered in scope under 10 CFR Part 54.4(a)(2) criterion.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-2 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the ductwork does not perform an in scope function and therefore is not within the scope of license renewal in accordance with 10 CFR 54.4(a).

In RAI 2.3.3.14-3, dated January 28, 2008, the staff identified fuel pool area recirculating air handling system ductwork and booster that were not identified on the drawings as in-scope or being subject to an AMR. The Scope Determination Summary states that certain ductwork and dampers associated with the Fuel Handling Building Normal HVAC System interface with the Fuel Handling Building Post-Accident Exhaust System and must maintain integrity in order to maintain negative pressure in the Fuel Handling Building post-accident. Therefore, the staff requested the applicant to clarify whether these components are in scope and are subject to AMR.

Applicant's Response and Staff's Evaluation

In a letter dated February 27, 2008, the applicant stated:

> The ductwork from PASS 2-2702-P5-SAP and Booster Fan 2-1541-B7-001-000 does not perform an in-scope function. NEI 95-10 Appendix F section 5.2.2.1 states that industry operating experience has shown no failures due to aging that have adversely impacted the accomplishment of a safety function. Failure of these non-safety related portions of ductwork is not a credible event which could impact the portion of duct that is in-scope for 10 CFR Part 54.4(a)(1). Therefore, the ductwork from PASS 2-2702-P5-SAP and Booster Fan 2-1541-B7-001-000 is not considered in scope under 10 CFR Part 54.4(a)(2) criterion.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-3 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the ductwork and booster fan do not perform an in scope function and therefore are not within the scope of license renewal in accordance with 10 CFR 54.4(a).

2.3.3.14.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the fuel handling building ventilation 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).

2.3.3.15 Ventilation Systems – Diesel Generator Building

2.3.3.15.1 Summary of Technical Information in the Application

LRA Section 2.3.3.15 describes the diesel generator building ventilation system, which ventilates and removes heat from the building during diesel generator operation and supplies sufficient heat for easy starting of the diesel generators and for personnel occupancy. The system is divided into two subsystems, ESF and non-ESF. During normal plant operation, the non-ESF heating system maintains a minimum temperature when the diesel generators are not running. Non-ESF building ventilation is also utilized as required for maintenance and personnel access.

The ESF ventilation system maintains the maximum temperature of the building below analyzed limits with the diesel generator operating. Building ventilation is by 100-percent outside air at summer design temperatures and by recirculation and outside air as the temperature drops in winter. Power for the ESF ventilation equipment is by the Class 1E bus of the same train as the diesel generator set ventilated.

The diesel generator building ventilation system contains safety-related components relied upon to remain functional during and following DBEs. In addition, the diesel generator building ventilation system performs functions that support fire protection.
LRA Table 2.3.3.15 identifies diesel generator building ventilation system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper housings
- ductwork and fittings
- fan housings
- filter housings - EDG control panel supply ventilation
- flexible connectors

The intended function of the diesel generator building ventilation system component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.15.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.15 and UFSAR Section 9.4.7 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In reviewing LRA Section 2.3.3.15, the staff identified areas in which additional information was necessary to complete the review of the results of the applicant's scoping and screening. Therefore, by letter dated January 28, 2008, the staff issued an RAI concerning the specific issues to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following paragraphs describe the staff's RAI and the applicant's related response.

In RAI 2.3.3.15-1, dated January 28, 2008, the staff identified that the diesel generator building ventilation system unit heater fans were not identified on the drawings as in-scope or being subject to an AMR. The Scope Determination Summary states that non-safety-related fan housings associated with this system are relied upon as missile barriers (for the fan element). Therefore, the staff requested the applicant to clarify whether these components are in scope and subject to an AMR.

In a letter dated February 27, 2008, the applicant stated:

> The Non-ESF Exhaust fan housings, perform a missile barrier function per 10 CFR 54.4(a)(2), and should have been shown as in scope on boundary drawings 1X4LD217 and 2X4LD217. Unit heaters, 1(2)-1566-U7001-000 through 1(2)-1566-U7-020-000, also perform a missile barrier function per 10 CFR 54.4(a)(2).

The applicant will add commodity type Fan Housings (ID No.4) in LRA Table 3.3.2.15. They will also provide the AMR for the Fan Housings, and a new commodity type Heater Housings to Tables 2.3.3-15 and 3.3.2-15, the latter of which will provide the AMR for the Heater Housings. The scoping determination (LRA Page 2.3-89) is also revised to reflect the addition in accordance with 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-1 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the fan housings are within the scope of license renewal in accordance with 10 CFR 54.4(a), and are subject to an AMR in accordance with 10 CFR 54.21(a) (1).

2.3.3.15.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the diesel generator building ventilation 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).

2.3.3.16 Ventilation Systems – Auxiliary Feedwater Pump House

2.3.3.16.1 Summary of Technical Information in the Application

LRA Section 2.3.3.16 describes the auxiliary feedwater pumphouse ventilation system, which provides heating, cooling and ventilation for an environment suitable for equipment and maintenance personnel. The system operates whenever the pumps operate during normal, accident, or loss-of-offsite-power conditions. This system utilizes both ESF and non-ESF outside air supply units. The ESF fans maintain the temperature in the pump rooms within analyzed limits. Pneumatically-operated dampers open automatically for natural ventilation of the turbine-driven auxiliary feedwater pump room during SBO.

The auxiliary feedwater pumphouse ventilation system contains safety-related components relied upon to remain functional during and following DBEs. In addition, the auxiliary feedwater pumphouse ventilation system performs functions that support fire protection and SBO.

LRA Table 2.3.3.16 identifies auxiliary feedwater pumphouse ventilation system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper housings
- ductwork and fittings
- fan housings

The intended function of the auxiliary feedwater pumphouse ventilation system component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.16.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.16 and UFSAR Section 9.4.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In reviewing LRA Section 2.3.3.16, the staff identified areas in which additional information was necessary to complete the review of the results of the applicant's scoping and screening. Therefore, by letter dated January 28, 2008, the staff issued an RAI concerning the specific issues to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following paragraphs describe the staff's RAI and the applicant's related response.

In RAI 2.3.3.16-1, dated January 28, 2008, the staff identified that the auxiliary feedwater pump house ventilation system unit heater fans were not identified on the drawings as in-scope or being subject to an AMR. The Scope Determination Summary states that non-safety-related fan housings associated with the system are relied upon as missile barriers (for the fan element). Therefore, the staff requested the applicant to clarify whether these components are in scope and subject to an AMR.

In a letter dated February 27, 2008, the applicant stated:

> The Housings for unit heaters, 1(2)-1593-U7-001-000 through 1(2)-1593-U7-007-000, perform a missile barrier function per 10 CFR 54.4(a)(2), and should have been shown as in scope on boundary drawings 1X4LD227 and 2X4LD227.

As a result, the applicant LRA Tables 2.3.3.16 (Item 4) and 3.3.2.16 (Items 4a and 4b), will be revised to include the missile barrier function. The scoping determination (LRA Page 2.3-91) is also revised to reflect the addition in accordance with 10 CFR54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-1 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the fan housings are within the scope of license renewal in accordance with 10 CFR 54.4(a), and are subject to an AMR in accordance with 10 CFR 54.21(a) (1).

2.3.3.16.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the auxiliary feedwater pump house ventilation 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).

2.3.3.17 Ventilation Systems – Miscellaneous

LRA Section 2.3.3.17 describes the miscellaneous ventilation systems, which include the following:

- electrical tunnel ventilation system
- piping penetration ventilation system
- fire protection facilities ventilation system

The electric tunnel ventilation system ventilates the tunnels carrying safety-related train-oriented cables, normal cables, or both to prevent excessive heat during normal operation, shutdown, refueling, and accident conditions. Essential system components ventilate the two diesel power cable tunnels (train A and train B), the two NSCW tower cable tunnels (train A and train B), and the turbine building and auxiliary building train A tunnel. Normal system components ventilate the turbine building chase to control building tunnel. Each tunnel has its own subsystem.

The piping penetration ventilation system provides cooling air to the main steam and feedwater pipe restraints in the main steam area and steam tunnel to keep concrete temperatures below limits. The system functions during normal plant operation, startup, cold shutdown, cooldown and hot standby, and refueling operations and remains functional during loss of offsite power. Power is from the non-Class 1E standby power system.

The fire protection facilities ventilation system uses fans and louvers to ventilate the fire protection pumphouses and fire protection valvehouses and maintain the air temperature within these structures at or below design temperature during fire pump operation. Two diesel-driven fire pumps are located in one of the pumphouses and an electric motor-driven fire pump in the other. The pump room ventilation components are within the scope of license renewal for fire protection.

The miscellaneous ventilation systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the miscellaneous ventilation systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the miscellaneous ventilation systems perform functions that support fire protection and EQ.

LRA Table 2.3.3.17 identifies miscellaneous ventilation systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper housings
- ductwork and fittings
- fan housings
- filter housings - tunnel supply air
- flexible connectors

The intended functions of the miscellaneous ventilation systems component types within the scope of license renewal include:

- missile barrier
- pressure-retaining boundary

2.3.3.17A Ventilation Systems – Electric Tunnel Ventilation

2.3.3.17A.1 Summary of Technical Information in the Application

The electric tunnel ventilation system ventilates the tunnels carrying safety-related train-oriented cables, normal cables, or both to prevent excessive heat during normal operation, shutdown, refueling, and accident conditions. Essential system components ventilate the two diesel power cable tunnels (train A and train B), the two NSCW tower cable tunnels (train A and train B), and the turbine building and auxiliary building train A tunnel. Normal system components ventilate the turbine building chase to control building tunnel. Each tunnel has its own subsystem.

2.3.3.17A.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.17 and UFSAR Section 9.4.9.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

In reviewing LRA Section 2.3.3.17, the staff identified areas in which additional information was necessary to complete the review of the results of the applicant's scoping and screening. Therefore, by letter dated January 28, 2008, the staff issued an RAI concerning the specific issues to determine whether the applicant has properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following paragraphs describe the staff's RAI and the applicant's related response.

In RAI 2.3.3.17A-1, dated January 28, 2008, the staff identified that electrical tunnel ventilation system drawing shows that the exhaust duct and fan are in scope, but the makeup air duct for this space were not identified on the drawings as in-scope or being subject to an AMR. The Scope Determination Summary states that non-safety-related fan housings associated with the system are relied upon as missile barriers (for the fan element). Therefore, the staff requested the applicant to clarify whether these components are in scope and subject to an AMR.

In a letter dated February 27, 2008, the applicant stated that the makeup air passageway and associated components perform a pressure boundary function for makeup air to the tunnels and should have been shown as in scope for 10 CFR 54.4(a)(2) on boundary drawings 1X4LD238 and 2X4LD238. The pressure boundary intended function will be added to the concrete components (Component Type IDs 1-4) in License Renewal Application tables 2.4.5 and 3.5.2-5 to account for the concrete portion of the passageways which serves a pressure boundary function for the makeup air.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17A-1 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the makeup air passageway and associated components are within the scope of license renewal in accordance with 10 CFR 54.4(a), and are subject to an AMR in accordance with 10 CFR 54.21(a) (1).

In RAI 2.3.3.17A-2, dated January 28, 2008, the staff identified that the electric tunnel ventilation system fan for the North-South Turbine Building Chase to Control Building tunnel ventilation and associated ductwork were not identified on the drawings as in-scope as being subject to an AMR therefore, the staff requested the applicant to clarify whether these components are in scope and subject to an AMR.

In a letter dated February 27, 2008, the applicant stated:

> the North-South Turbine Building Chase to Control Building Tunnel Ventilation Fan 1(2)-1540-B7-007-000 and associated ductwork are not credited in the design calculations for exhausting the Turbine Building and Auxiliary Building Train A Tunnel. The purpose of these fans is to recirculate and, thereby, prevent a stagnant air condition in the adjoining Turbine Building Chase to Control Building Tunnel during normal plant conditions. Therefore, the North-South Turbine Building Chase to Control Building Tunnel Ventilation Fan 1(2)-1540-B7-007-000 and associated ductwork are not in scope for license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.17A-2 acceptable, because it is the staff's understanding, based on the applicant's response to the staff's RAI, that the North-South Turbine Building Chase to Control Building. Tunnel Ventilation Fan (1(2)-1540-B7-007-000) and associated duct are not in scope of license renewal in accordance with 10 CFR 54.4(a), and are not subject to an AMR in accordance with 10 CFR 54.21(a)(1).

2.3.3.17A.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the electric tunnel ventilation 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).

2.3.3.17B Ventilation Systems – Piping Penetration Ventilation

2.3.3.17B.1 Summary of Technical Information in the Application

The piping penetration ventilation system provides cooling air to the main steam and feedwater pipe restraints in the main steam area and steam tunnel to keep concrete temperatures below limits. The system functions during normal plant operation, startup, cold shutdown, cooldown and hot standby, and refueling operations and remains functional during loss of offsite power. Power is from the non-Class 1E standby power system.

2.3.3.17B.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.17 and UFSAR Section 9.4.9.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.17B.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the piping penetration ventilation 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).

2.3.3.17C Ventilation Systems – Fire Protection Facilities HVAC

2.3.3.17C.1 Summary of Technical Information in the Application

The fire protection facilities ventilation system uses fans and louvers to ventilate the fire protection pumphouses and fire protection valvehouses and maintain the air temperature within these structures at or below design temperature during fire pump operation. Two diesel-driven fire pumps are located in one of the pumphouses and an electric motor-driven fire pump in the other. The pump room ventilation components are within the scope of license renewal for fire protection.

2.3.3.17C.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.17 and UFSAR Section 9.5.1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.17C.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the fire protection facilities HVAC 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).

2.3.3.18 Ventilation Systems – Radwaste Buildings HVAC

2.3.3.18.1 Summary of Technical Information in the Application

LRA Section 2.3.3.18 describes the radwaste building ventilation systems, which include the ventilation systems for the radwaste transfer building, radwaste transfer tunnel, and dry active waste (DAW) Facilities.

The functions of the radwaste transfer building, radwaste transfer tunnel, and DAW facilities HVAC systems are to:

- heat, cool, and ventilate the DAW facility for proper operation of equipment and personal comfort of maintenance or operations personnel
- distribute and exhaust air suitably to reduce possible concentrations of radioactive and chemical impurities in the process areas
- draw effluent exhaust air from the radwaste transfer building through the auxiliary building filtration system
- ventilate the tunnel as required for periodic inspection

The radwaste transfer building and radwaste transfer tunnel HVAC systems are abandoned except for the auxiliary building filtration system exhaust ductwork from the auxiliary building radwaste area filter exhaust and continuous exhaust system; however, a fire damper in the west fire-rated wall to prevent smoke and fire from translating to the auxiliary building via the radwaste transfer tunnel is in the fire protection program, which is credited for 10 CFR 50.48 compliance and is within the scope of license renewal for fire protection. The radwaste building ventilation systems perform functions that support fire protection.

LRA Table 2.3.3.18 identifies radwaste building ventilation systems component types within the scope of license renewal and subject to an AMR:

- damper housings
- ductwork and fittings

The intended function of the radwaste building ventilation systems component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.18.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.18 and UFSAR Section 9.4.3.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.18.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the radwaste building HVAC 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).

2.3.3.19 Fire Protection Systems

2.3.3.19.1 Summary of Technical Information in the Application

LRA Section 2.3.3.19 describes the fire protection systems, which include the following:

- fire protection water system
- fire protection seismic Category 1 water system
- fire protection halon systems

The fire protection water system minimizes both the probability and the consequences of postulated fires by adequate means for prompt fire detection, suppression, and control. The primary goals of the fire protection water system are to ensure performance of design functions required for safe plant shutdown and to minimize the probability of radioactive releases to the environment in a fire. To prevent or limit fire damage to safety-related SCs so at least one redundant train of equipment is available for safe shutdown, the system relies on fire prevention, fire suppression, fire detection and annunciation, suppression system automatic supervision, fire separation and confinement, fire extinguishment, fire brigade implements, and plant design features to minimize fires and their consequences. Fire water suppression systems include fire tanks and pumps, automatic and manual spray and sprinkler systems, hose stations, fire hydrants and hose houses, and fire mains or yard loop headers to supply water to extinguish fires. Consumables and short-lived components (*e.g.*, fire extinguishers, self-contained breathing apparatus air bottles, fire brigade accouterments like boots, gloves, and helmets, and fire hoses) are included in this system.

Screening of the fire detection and actuation portion of this system is as part of the electrical and instrumentation and controls systems (see LRA Section 2.5), of fire dampers as parts of the assigned HVAC system, of other passive fire barriers as parts of the structural systems (see LRA Section 2.4), and of the RCP oil collection system as part of the RCS and connected lines (LRA Section 2.3.1.3).

The fire protection - seismic Category 1 water system supplies fire-extinguishing water for manual hose stations in areas with equipment required for safe shutdown after a safe shutdown earthquake that might disable the normal fire protection system. This system fights fires following a safe shutdown earthquake if no other source of fire-fighting water is available. The system is completely manual with hose stations and stand pipes in the containment, diesel generator, auxiliary, and control buildings. The NSCW system supplies water by manual valves normally locked closed.

The fire protection halon system, which protects by halon fire-extinguishing gas electrical equipment which supports safe plant shutdown, is composed of halon cylinders, discharge piping, local halon control panels, and instruments. Shutdown panels in the control building shutdown panel rooms and ventilation equipment in the control building records storage room supporting safe plant shutdown are protected from fire by packaged halon flooding systems. Other plant spaces and electrical equipment not supporting safe plant shutdown but fire-protected by packaged halon systems include the plant operating computer; the service building communications room; the service building plant documentation storage rooms; and the technical support center communication, computer, cathode ray tube (CRT) display, and electrical equipment rooms.

The fire protection systems contain safety-related components relied upon to remain functional during and following DBEs. In addition, the fire protection system performs functions that support fire protection and EQ.

LRA Table 2.3.3.19 identifies fire protection systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- fire hydrants
- flame arrester elements
- flame arrester housings
- flexible connectors
- flow orifice/elements
- fusible links and sprinkler head bulbs
- hose station nozzles and hose connections
- hose stations
- piping components
- pump casings - fire pumps (diesel-driver, motor-driven, and jockey pumps)
- sight glasses
- silencers
- spray shields
- sprinkler heads and spray nozzles
- strainer elements
- strainer housings
- tanks - fuel oil storage tanks (fire pump diesel)
- tanks - fire protection water storage tanks
- valve bodies

The intended functions of the fire protection systems component types within the scope of license renewal include:

- protection from debris

- prevention of flame propagation from ignition of vent pipe vapors back to the source

- spray shield or curbs for flow direction

- flow pattern or distribution provision
- restriction of process flow
- pressure-retaining boundary

2.3.3.19.2 Staff Evaluation

The staff reviewed the VEGP LRA**,** Section 2.3.3.19, (UFSAR), Section 9.5.1; NUREG-1137, "Safety Evaluation Report Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2," through Supplement 5; and NUREG-1137, "Safety Evaluation Report Related to the Operation of Vogtle Electric Generating Plant, Units 1 and 2," through Supplement 9; approving the VEGP Fire Protection Program listed in the VEGP Units 1 and 2 Operating License Condition 2.G, using the evaluation methodology described in SER, Section 2.3, and the guidance in SRP-LR**,** Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff also reviewed VEGP Units 1 and 2 commitments to Title 10 CFR 50.48, "Fire protection" (i.e., approved fire protection program), using their commitment documents to the Branch Technical Position (BTP) Chemical and Mechanical Engineering Branch (CMEB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," Revision 2, July 1981, documented in the fire protection CLB.

The staff's review of LRA, Section 2.3.3.19, 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 2.3.3.19-1, dated January 28, 2008, the staff stated that the following LRA drawings show fire protection system components as out of scope (i.e., not colored in red):

LRA drawing CX4LD173-2:

- Fire Hydrants
- Fire Protection Piping to Turbine Building, Steam Tunnel, and Radwaste Solidification Building
- Intake Structure

LRA drawing CX4LD173-4, in the following locations:

- Dry Active Waste Processing Facility
- Dry Active Waste Storage Building

LRA drawing 1X4LD174-1, Halon 1301 fire protection system in the following locations:

- Computer Room Level A
- Computer CRT Display and Communication Rooms Level 1
- Radwaste Solidification Building Contamination Oil Room Level 1
- Radwaste Solidification Building Elevation 192'-0"

LRA drawing 2X4LD174-1, Halon 1301 fire protection system's in the following location:

- Computer Room Level A

The staff requested that the applicant verify whether the above systems and components are 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 these components are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion. By letter dated February 27, 2008, the applicant stated that:

> The fire protection SCs that are relied upon in the event of a fire to maintain the ability to perform reactor plant safe shutdown functions at VEGP (including plant SCs that are relied upon to perform safe shutdown in the event of a fire), or to minimize radioactive releases to the environment in the event of a fire, are in-scope for license renewal - see VEGP-LR-TE-007, "Technical Evaluation VEGP Fire Protection Scoping." For the fire protection system, certain SCs are in scope for license renewal and certain SCs are not in scope, depending on whether they are relied upon for 10 CFR 50.48 and Branch Technical Position (BTP) CMEB 9.5-1 compliance or not (hereafter referred to as "regulatory compliance"). The following is a breakdown of fire protection SCs and a discussion of in-scope applicability:
>
> Drawing CX4LD173-2: The fire hydrants listed in UFSAR Table 9.5.1-10D are required for regulatory compliance and are in scope and highlighted as such on the drawing. Those fire hydrants not in UFSAR Table 9.5.1-10D are not required for regulatory compliance and are not in scope and thus not highlighted on the drawing. The fire protection piping to the Turbine Building (including steam tunnels) is not in scope because the fire protection system in the Turbine Building is not relied upon for regulatory compliance (FSAR Appendix 9B, paragraph C.7.h). Refer to the answer to RAI 2.1-2 for discussion regarding non-safety related components in the Turbine Building.
>
> The fire protection system in the Radwaste Solidification Building is not in scope because the building has been abandoned in place and there is no radioactive material stored there (UFSAR Section 11.4.2.4).

Since the Intake Structure is not in the scope of license renewal, the fire protection system in this structure is not in scope. See License Renewal Civil Boundary Drawing AX1 D45L01. In evaluating this response, the staff finds that it was incomplete and that review of LRA, Section 2.3.3.19, could not be completed. Several yard fire hydrants are excluded from the scope of license renewal and from subject to an AMR.

During a conference call, the staff questioned, in RAI 2.3.3.19-1, the applicant's methodology, which excluded certain fire hydrants from the scope of the license renewal and subject to an AMR. In its response dated June 23, 2008, the applicant stated that:

> Fire protection SCs that are relied upon in the event of a fire to maintain the ability to perform reactor plant safe-shutdown functions at VEGP (including plant SCs that are relied upon to perform safe-shutdown in the event of a fire), or to minimize radioactive releases to the environment in the event of a fire are in-scope for license renewal. For the fire protection system, certain SCs are in scope for license renewal and certain SCs are not in scope, depending on whether they are relied upon for 10 CFR 50.48 and BTP CMEB 9.5-1 compliance or not (hereafter referred to as "regulatory compliance").

The CLB for VEGP's fire protection system is as follows:

The fire protection systems described in the VEGP UFSAR conform to General Design Criterion 3 as stated in UFSAR Section 3.0 (10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 3, "Fire Protection"). The scoping criteria in 10 CFR 54.4(a)(3) states that plant SCs within the scope of this part are "…relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the NRCs regulation for fire protection (10 CFR 50.48)..." In addition to compliance with General Design Criterion 3 and 10 CFR 50.48,
VEGP also utilizes the detailed guidance of BTP CMEB 9.5.1, "Guidelines for Fire Protection for Nuclear Power Plants."

10 CFR 50.48 dictates that each applicant must have a fire protection plan that satisfies Criterion 3 of Appendix A to 10 CFR 50. Criterion 3, "Fire Protection," stipulates: "Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions. Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room. Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components *important to safety*. Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the *safety capability* of these structures, systems, and components." 10 CFR 50.48 requires that the plan describe specific features necessary to implement the program such as automatic and manually operated fire detection and suppression systems, and the means to limit fire damage to SCs important to safety so that the capability to shut down the plant safely is ensured.

The VEGP fire protection program is described in detail in the UFSAR and was approved as described in the UFSAR and other licensing documents by the NRC in the operating license:

> Southern Nuclear shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety

Analysis Report for the facility, and submittals dated July 2, August 4 and 13, October 10 and 24, November 5, and December 19, 1986, and January 2, 1987, as approved in the SER (NUREG-1137) through Supplement 5 subject to the following provision:

Southern Nuclear may make changes to the approved fire protection program without prior approval of the Commission, only if those changes would not adversely affect the ability to achieve and maintain safe-shutdown in the event of a fire.

The SER (NUREG-1137) was reviewed through Supplement 9 to help make scoping determinations.

NUREG-1800 section 2.1.3.1.3, “Regulated Events,” is a source of additional guidance on applying the scoping criteria of 10 CFR 54.4(a)(3). It states that “...all SCs that are relied upon in the plant's CLB (as defined in 10 CFR 54.3), plant-specific experience, industry-wide experience (as appropriate), and safety analyses or plant evaluations to perform a function that demonstrates compliance with NRC regulations identified under 10 CFR 54.4(a)(3), are required to be included within the scope of the rule.” In addition, it limits the extent of the review with the statement that "an applicant need not consider hypothetical failures or second-, third-, or fourth-level support systems in determining the SCs within the scope of the rule for 10 CFR 54.4(a)(3).” This guidance is not intended to exclude any support system...that is specifically relied upon for compliance with, the applicable NRC regulation. The guidance also recognizes that “mere mention of an SC in the analysis or evaluation does not necessarily constitute support of an intended function as required by the regulation.” Thus, the mention of a system, structure, or component in an analysis or evaluation (e.g., UFSAR, etc.) does not in and of itself constitute reliance on the SC for regulatory compliance. Fire protection components also exist solely to satisfy insurance requirements and are likewise not relied upon for regulatory compliance and are not in the CLB.

In general, every fire protection system, structure, and component was reviewed against the current licensing basis and scoping determinations were made based on whether the SC is part of the CLB or not.

For the fire protection water system, portions of the system that are in scope for 10 CFR 54.4 a(3) are separated from portions of the system that are not in scope by manual isolation valves that are normally open. These valves remain normally open so that in the event of a fire in a not-in-scope portion of the system, water may be immediately available for fire suppression following automatic initiation of the detection/suppression system(s) in the not-in-scope portion. This also applies to not-in-scope yard fire hydrants that may be used to manually suppress fires. Should an age related pressure boundary failure occur in the not-in-scope portion of the system such that a significant system pressure drop results, an alarm would notify plant personnel and the fire water pump(s) would start automatically. Following the alarm and pump start, plant personnel would investigate the cause and manually close the isolation valve(s) separating the failed not-in-scope portion of the system from the in-scope portion, as warranted, considering the need to preserve fire water inventory for 10 CFR 50.48 compliance. The design of the system provides multiple pumps and a large volume of stored water which can be used to maintain system pressure while the location of a leak is identified and isolated. Ample time is available to isolate a leak in a not-in-scope location before operability of the 50.48 protection features can be affected. Therefore, terminating the license renewal boundary at an open manual isolation valve is acceptable.

Based on its review, the staff finds the applicant's response to the first portion of RAI 2.3.3.19-1 acceptable. The fire hydrants included in scope of license renewal encompass the fire hydrants included in Table 9.5.1-10D, UFSAR Amendment 28, November 14, 1985, and reviewed and approved by the staff in Supplement 4 to NUREG-1137, December 1985, as a part of the original CLB of VEGP. This report is referenced directly in the VEGP fire protection CLB and summarizes the fire protection program and commitments to 10 CFR 50.48 using BTP CMEB 9.5-1. Supplement 4 to NUREG-1137 reviewed the VEGP UFSAR Amendments 24, 25, and 28, in which the applicant made substantial changes to its fire hazards analysis for compliance with the guidelines set forth in BTP CMEB 9.5-1. Originally VEGP UFSAR Amendment 28, Table 9.5.1-10D, consisted of four hydrants for Unit 1. After Unit 2 commercial operation, seven hydrants were added in Table 9.5.1-10D based on the Unit 2 fire hazard analysis.

The staff finds the hydrants in question are not credited to meet the requirements of Appendix R for achieving safe-shutdown in the event of a fire and were correctly excluded from the scope of license renewal and not subject to an AMR. Therefore, the staff’s concern described in the first portion of RAI 2.3.3.19-1 is resolved.

In its response, by letter dated February 27, 2008, the applicant stated that, in Drawing CX4LD173-4:

> The fire protection systems in the Dry Active Waste Processing Facility and Dry Active Waste Storage Building are in the scope of license renewal. Although these buildings are in the scope of license renewal, they are categorized as structures and are not highlighted on mechanical boundary drawing CX4LD173-4 because this drawing is strictly a mechanical boundary drawing as stated in the drawing title block. Structures are sometimes shown on mechanical boundary drawings for clarity in describing the mechanical system, but the structure itself is not highlighted on the mechanical boundary drawings. For the highlighted in-scope structures, see License Renewal Civil Boundary Drawing AX1 D45L01.

Based on its review, the staff finds the applicant’s response to the second portion of RAI 2.3.3.19-1 acceptable because the applicant explained that the fire suppression systems and components in the Dry Active Waste Processing Facility and Dry Active Waste Storage Building are in scope of license renewal and subject to an AMR. The applicant identified that, although the Dry Active Waste Processing Facility and Dry Active Waste Storage Building are in scope of license renewal and categorized as structures, they are not highlighted on mechanical boundary drawing CX4LD173-4. However, these structures are highlighted on the civil boundary drawing AX1D45L01. Therefore, the staff is adequately assured that the above fire suppression systems and components for fire suppression in the Dry Active Waste Processing Facility and Dry Active Waste Storage Building will be considered appropriately during the aging management activities. Therefore, the staff’s concern described in the second portion of RAI 2.3.3.19-1 is resolved.

In its response, by letter dated February 27, 2008, the applicant stated that in, Drawing 1X4LD174-1:

> The Halon systems in the Computer Room Level A, Computer CRT Display and Communication Rooms Level 1, Radwaste Solidification Building Contamination Oil Room Level 1, and the Radwaste Solidification Building Elevation 192'-0" are shown not highlighted on drawing 1X4LD174-1. UFSAR Table 9.5.1-10, paragraph 4.1, lists the fixed Halon systems required for regulatory compliance and these systems are highlighted on drawing 1X4LD174-1. The above listed Halon systems are not in this table because they are not required for regulatory compliance and are thus not in the scope of license renewal. The fire protection system in the Radwaste Solidification Building is not in scope because it has been abandoned in place and there is no radioactive material stored there (FSAR Section 11.4.2.4).

In its response, by letter dated February 27, 2008, the applicant stated that in, Drawing 2X4LD174-1:

> The Halon system in the Computer Room Level A is shown not highlighted on drawing 2X4LD174-1. UFSAR Table 9.5.1-10, paragraph 4.1, lists the fixed Halon systems required for regulatory compliance and these systems are highlighted on drawing 2X4LD174-1. The above listed Halon system is not in this table because it is not required for regulatory compliance and is thus not in the scope of license renewal.

The staff finds that the applicant's two responses shown above, acceptable. The total flooding Halon 1301 systems in Computer Room Level A, Computer CRT Display and Communication Rooms Level 1, Radwaste Solidification Building Contamination Oil Room Level 1, and the Radwaste Solidification Building Elevation 192'-0, 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. Although the total flooding Halon 1301 fire suppression system for the above areas are addressed in the NUREG-1137, these systems in question are not credited to meet the requirements of Appendix R for achieving safe-shutdown in the event of a fire. The staff has confirmed that the applicant correctly excluded the above total flooding Halon 1301 fire suppression systems from scope of license renewal and subject to an AMR. Therefore, the staff's concerns described in the third and fourth portions of RAI 2.3.3.19-1 are resolved.

In RAI 2.3.3.19-2, dated January 28, 2008, the staff stated that LRA, Section 2.3.3.19, discusses requirements for the fire water supply system but does not mention trash racks and traveling screens for the fire pump suction water supply. Trash racks and traveling screens are located upstream of the fire pump suctions to remove any major debris from the fresh or raw water. Trash racks and traveling screens are necessary to remove debris from and prevent clogging of the fire protection water supply system. Trash racks and traveling screens are typically considered to be passive, long-lived components. Both trash racks and traveling screens are located in a fresh or raw water/air environment and are typically constructed of carbon steel. Carbon steel in a fresh or raw water environment or water/air environment is subject to loss of material, pitting, crevice formation, and microbiologically influenced corrosion, and fouling. The staff requested that the applicant explain the apparent exclusion of the trash racks and traveling screens that are located upstream of the fire pump suctions from 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).

By letter dated February 27, 2008, the applicant provided the following response:

> VEGP's fire pumps take suction from fire water storage tanks and as such, do not have trash racks and traveling screens. See LRA drawing CX4LD173-1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-2 acceptable because it adequately described that the intended function supporting the fire pump suction supply is accomplished from the water storage tanks for Units 1 and 2. The fire pumps at VEGP do not take suction from a natural source or bay; therefore, trash racks and traveling screens are not required. Additionally, water tanks are in license renewal scope and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.19-2 is resolved.

In RAI 2.3.3.19-3, dated January 28, 2008, the staff stated that LRA, Table 2.3.3-19, excludes several types of fire protection components that appear in NUREG-1137 and its supplements and/or the UFSAR, and which also appear in the LRA drawings colored in red. These components are listed below:

- Hose racks
- Yard hose houses
- Interior fire hose stations
- Pipe fittings
- Pipe supports and hangers
- Couplings
- Threaded connections
- Restricting orifices
- Interface flanges
- Dikes for oil spill confinement
- Floor drains and curbs for fire-fighting water
- Filter housing
- Heater housing
- Chamber housing
- Actuator housing
- Halon storage tanks/bottles
- Buried outside diesel fuel storage tanks
- Buried fire protection piping and underground fire main loop
- Heat exchanger (bonnet)
- Heat exchanger (shell)
- Heat exchanger (tube)
- Post-indicator sectional control valves
- Turbocharger
- Tank heater
- Thermowells
- Expansion joints
- Gear box housing

- Lubricating oil collecting system components (reactor coolant pump)
- Engine intake and exhaust silencers/muffler (diesel driven fire pump)
- Backflow prevention devices
- Flame retardant coating for cables
- Fire retardant coating for structural steel supporting walls and ceilings
- Fire barrier penetration seals
- Fire barrier walls, ceilings, floor, and slabs
- Fire doors
- Fire rated enclosures

The staff requested that the applicant verify whether the components listed above should be included in LRA, Table 2.3.3.19. If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

By letter dated February 27, 2008, the applicant stated that:

> For the most part, the above listed fire protection components are in the scope of license renewal. In some cases, the item is not specifically listed in Table 2.3.3.19 but is included as one of the component types listed in the table. For example, "pipe fittings" and several other components listed above are included as "piping components" in Table 2.3.3.19. This is consistent with the guidance provided in NEI 95-10, Revision 6, and Appendix B. The following is a breakdown of how each component is treated in license renewal:

1) Hose racks are in scope and form part of a hose station, and as such, are included as “hose stations” in Table 2.3.3.19.
2) Yard hose houses are not in the scope of license renewal because they are not required for regulatory compliance and are a second level support system for yard fire hydrants and fire hydrant fire hoses. These structures are small sheds associated with yard fire hydrants and serve as a convenient location for storing tools and the accompanying fire hydrant fire hoses. These structures also afford limited protection from the weather for the fire hydrants and fire hoses. However, convenience of fire hydrant accessory storage and limited protection from the weather for the fire hydrants and fire hoses are not credited in license renewal and not required for regulatory compliance. Hypothetical failure of a hose house, which is a second level support system, need not be considered in determining the SCs within the scope of the rule under 10 CFR 54.4(a)(3) -see NUREG-1800, Revision 1, Section 2.1.3.1.3. The cast iron fire hydrants are in scope and age managed in the outdoor environment (fire hydrants in Table 2.3.3.19) and the fire hoses are in scope but are short-lived, being subject to periodic replacement and as such, do not require an AMR.
3) Interior fire hose stations are in scope and included in hose station nozzles and hose connections and hose stations in Table 2.3.3.19.
4) Pipe fittings are in scope and included in "piping components" in Table 2.3.3.19.
5) Pipe supports and hangers are in scope and considered structural

components and covered in Table 2.4.12.

6) Couplings are in scope and included in "piping components" in Table 2.3.3.19.
7) Threaded connections are in scope and included in "piping components" in Table 2.3.3.19.
8) Restricting orifices are in scope and included in "flow orifice/element" in Table 2.3.3.19.
9) Interface flanges are in scope and included in "piping components" in Table 2.3.3.19.
10) Dikes for oil spill confinement are considered to be part of the in-scope structure in which they are located and are included in structural concrete commodities in LRA section 2.4.
11a) Curbs for containment of spilled water, including fire fighting water, are considered to be part of the in-scope structure in which they are located and are also included in structural concrete commodities in LRA Section 2.4.
11b) Floor drains for processing spilled water, including fire fighting water, are included in the "Drains Systems" and are found in Table 2.3.3.23. The structures for which the drain systems are in scope include the containment building, the auxiliary building, and the control building, and the fuel handling building. The NSCW structure has a leak detection system with associated level switches and alarms. The drain or leak detection features for these structures are in scope primarily for mitigation of flooding due to a line break. However, release of fire protection system water in these structures would also be processed by these in-scope drains. The drain systems for the other structures that contain in-scope fire protection systems are not credited in the CLB for mitigation of flooding and are therefore not in the scope of license renewal. Flooding analyses have determined that flooding in these structures will not impact any safety-related equipment. References: VEGP-LRTE-010, "Scoping Methodology for Nonsafety Related Equipment that Could Affect Safety Related Equipment," Section 5.3.2; UFSAR Sections 3F.2.4, 3.4.1, and 9.3.3.
12) Filter housings are in scope and included as "strainer housings" in Table 2.3.3.19.
13) Heater housings are associated with the fire water pump diesel engines' on-skid heat exchangers. The fire pump diesel engines and the on-skid equipment are in scope but are complex active assemblies, not subject to an AMR.
14) Chamber housings include retard chambers in fire suppression systems. Chambers are in scope and included as "piping components" in Table 2.3.3.19.
15) Actuator housings include dry pilot actuator housings in fire suppression systems. Actuator housings are in scope and included as "valve bodies" in Table 2.3.3.19.
16) Halon storage bottles are in scope and are short-lived, being subject to periodic replacement and as such, do not require an AMR.
17) The fire pump diesel fuel oil storage tanks are in scope but are not buried, being located outside, above ground level. They are included in Table 2.3.3.19 as “tanks -F. O. storage tanks (fire pump diesel).”

18) The buried fire protection piping and underground fire main loop are in scope and included in Table 2.3.3.19 as follows: piping components; fire hydrants; valve bodies; closure bolting.
19) Heat exchanger bonnets are associated with the fire water pump diesel engines' on-skid heat exchangers. The fire pump diesel engines and the on-skid equipment are in scope but are complex active assemblies, not subject to an AMR.
20) Heat exchanger shells are associated with the fire water pump diesel engines' on-skid heat exchangers. The fire pump diesel engines and the on-skid equipment are in scope but are complex active assemblies, not subject to an AMR.
21) Heat exchanger tubes are associated with the fire water pump diesel engines' on-skid heat exchangers. The fire pump diesel engines and the on-skid equipment are in scope but are complex active assemblies, not subject to an AMR.
22) The post-indicator sectional control valves are in scope and included as "valve bodies" in Table 2.3.3.19.
23) The turbochargers are associated with the fire water pump diesel engines and are mounted on the engines. The fire pump diesel engines, their appurtenances, and the on-skid equipment are in scope but are complex active assemblies, not subject to an AMR.
24) There are no tank heaters associated with the fire protection system tanks -fire water storage tanks or fire pump diesel fuel oil storage tanks.
25) Thermowells are in scope and included as "piping components" in Table 2.3.3.19.
26) Expansion joints are in scope and included as "flexible connectors" in Table 2.3.3.19.
27) Gear box housings for such components as electric motor driven equipment are in scope but are part of the complex active assembly and not subject to an AMR.
28) The lubricating oil collecting system components (reactor coolant pump) are in scope and included in the RCS in Table 2.3.1.3 as follows: RCP lube oil drain tank; RCP lube oil drain tank flame arrestor element; RCP lube oil drain tank flame arrestor housing; RCP lube oil drip pans and enclosure; piping components.
29) The engine intake and exhaust silencers/mufflers (diesel driven fire pump) are in scope. The mufflers are mounted on the fire pump house roof and are included in Table 2.3.3.19 as "silencers." The intake silencers are mounted on the engine skids and are part of the complex active engine assembly and as such, do not require an AMR.
30) The backflow prevention devices include check valves and are included in Table 2.3.3.19 as "valve bodies".
31) Flame retardant coatings are not used at VEGP for cables.
32) Fire retardant coatings for structural steel supporting walls and ceilings are in scope and included in LRA Section 2.4.12 and Table 2.4.12, Item 13.
33) Fire barrier penetration seals are in scope and included in LRA Section 2.4.12 and Table 2.4.12, Item 18.
34) Fire barrier walls, ceilings, floors, and slabs are in scope and included in LRA Section 2.4.12 and Table 2.4.12, Items 14 and 15.
35) Fire doors are in scope and included in LRA Section 2.4.12 and Table

2.4.12, Item16. 36.) Fire rated enclosures are in scope and included in LRA Section 2.4.12 and Table 2.4.12, Items 12 and 17.

36) Fire rated enclosures are in scope and included in LRA Section 2.4.12 and Table 2.4.12, Items 12 and 17.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-3 acceptable. Although the applicant states that they consider some components to be included in other line items, the descriptions of the line items in the LRA do not actually list all these components specifically. Further the applicant has committed to interpret some components, for example, dikes for oil spill confinement and curbs for fire-fighting, as being included in structural concrete commodities in LRA, Section 2.4. Floor drains for processing spilled water, including fire-fighting water in the “Drains Systems” in LRA, Table 2.3.3.23 are considered to be part of the in-scope structure. The applicant has included the following items in the scope of license renewal and subject to an AMR because of their intended functions as part of the pressure boundary: (1) hose racks are included in hose stations commodity; (2) interior fire hose stations are included in hose station nozzles and hose connection commodity; (3) pipe fittings, couplings, threaded connections, interface flanges, chamber housing, and thermowells are included in piping components commodity; (4) pipe supports, fire retardant coatings for structural steel, fire barrier penetration seals, fire barrier wall, ceiling, floor, and slabs, fire doors, and fire rated enclosures are included in Section 2.4.12 and Table 2.4.12; (5) buried fire protection piping and underground fire main loop are included in Table 2.3.3.19 as piping components fire hydrants, valve bodies and closure bolting; (6) restricting orifices are included in flow orifice/element commodity (7) actuator housings, backflow prevention devices, and post-indicator sectional control valves are included in valve bodies commodity;(8) expansion joints are included in flexible connectors commodity; (9) lubricating oil collection system components are included in Table 2.3.1.3.

The applicant considered the Halon 1301 storage bottles to be in the scope of license renewal but excluded from the AMR. The applicant stated that Halon storage bottles are replaced periodically and, therefore, not subject to an AMR. The applicant excluded Halon storage bottles from an AMR under 10 CFR 54.21(a)(1)(ii) on a plant-specific basis. The applicant routinely monitors Halon storage bottles based on performance or condition criteria ensuring that storage bottles will maintain their intended function. Because the applicant has interpreted the Halon storage bottles as part of an active component (condition monitoring to determine whether the Halon storage bottles are at the end of their qualified lives), the staff concludes that the component was correctly excluded from the scope of license renewal and is not subject to an AMR. Because the applicant committed to treat these components as included in the line items specified, the staff is adequately assured that these components will be considered appropriately during plant aging management activities.

For each of the following components, the staff finds that they were not included in the line item descriptions in the LRA for an AMR: heat exchanger bonnets, shells, and tubes; fire pump turbocharger; gear box housings; diesel driven fire pump intake silencers; and heater housings. The staff recognizes that the applicant’s interpretation of these components as active (short-lived component) will results in more vigorous oversight of their condition and performance.

Because the applicant has interpreted heat exchanger bonnets, shells, and tubes; fire pump turbocharger; gear box housings; diesel driven fire pump intake silencers; and heater housings as active, the staff concludes their exclusion from scope of license renewal is correct and that they are not subject to an AMR.

The staff finds that the yard hoses were not included in the line item descriptions in the LRA table. The applicant stated that yard fire hydrants are housed in small sheds; fire hoses are in scope but are short-lived, being subject to periodic replacement. Therefore, they do not require an AMR. The staff recognizes the applicant's interpretation of these components as active, which will result in more vigorous oversight of the condition and performance of the components. The staff concludes that the above components were excluded correctly from the scope of license renewal and are not subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.19-3 is resolved.

In RAI 2.3.3.19-4, dated January 28, 2008, the staff informed the applicant that NUREG-1137 and its supplements listed various types of fire suppression systems provided in the plant areas for fire suppression activities. The fire suppression systems in various areas are:

> Total flooding Halon 1301 systems for two shutdown panel rooms, computer room, and five non-safety-related areas in the control building.
>
> - Dry standpipe for the control building, containment building, and auxiliary building
> - Deluge systems for charcoal filter assemblies
> - Dry pre-action sprinkler systems below the reactor coolant pumps and in areas of high cable tray concentrations
> - Cable spreading room automatic pre-action sprinkler system
> - Wet standpipe and hose system throughout the plant

The staff requested that the applicant verify whether the above fire suppression systems installed in various areas of the plant are 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 that the applicant provide justification for the exclusion.

By letter dated February 27, 2008, the applicant stated that:

The above listed fire protection systems are in the scope of license renewal as follows:

1) The total flooding Halon 1301 systems required for regulatory compliance are in scope. See response to 2.3.3.19-1 for details.
2) The dry standpipe systems for the control building, containment building, and auxiliary building are in scope. See License Renewal Boundary Drawings 1X4LD174-6 and 2X4LD174-6.

3) The deluge systems for charcoal filter assemblies are in scope. See License Renewal Boundary Drawings 1X4LD205-1, 1X4LD208-1, 1X4LD209, 1X4LD213-1, 1X4LD213-2, AX4LD204-1, AX4LD206-1, AX4LD206-3, AX4LD215, AX4LD235, 2X4LD205-1, 2X4LD208-1, 2X4LD213-1, and 2X4LD213-2. It is noted that two charcoal filters (1-1562-N7-001 & 002) on boundary drawing 1X4LD209 in the control building on Unit 1 have been abandoned in place and the charcoal removed from the filter units. The manual fire protection spray systems for these two filters are not required and are not in-scope. The fire protection in-scope boundary terminates at the first isolation valve in each filter unit's fire water supply header. The high temperature fire alarm that was in each filter's charcoal bed has been disabled.
4) The dry pre-action sprinkler systems below the reactor coolant pumps and in areas of high cable tray concentrations in the containment building were never installed. See NUREG-1137, Supplement No.2, Section 9.5.1.6.
5) The cable spreading room automatic pre-action sprinkler systems are in scope. See License Renewal Boundary Drawings 1X4LD174-3, rooms R-A44 and R-225 at coordinates D-2 and G-3 respectively; 2X4LD174-3, rooms R-A23 and R-224 at coordinates D-2 and G-3, respectively.
6) The wet standpipe and hose system throughout the plant is in scope. See License Renewal Boundary Drawings 1X4LD174-2, 1X4LD174-3, 1X4LD174-4, 2X4LD174-2, 2X4LD174-3, and 2X4LD174-4.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.19-4 acceptable. The applicant stated that all above mentioned fire suppression systems in various area of the plant are in scope; except for the Unit 1 control building charcoal filter deluge system because the two charcoal filters for this system have been abandoned in place. Further, the applicant informed the staff that the dry-action sprinkler systems, which were to be located below the reactor coolant pumps and in areas of high cable tray concentrations in the containment building, were never installed.

The total flooding Halon 1301 systems in Computer Room Level A, Computer CRT Display, and Communication Rooms Level 1, 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. Although the total flooding Halon 1301 fire suppression system for the above areas are addressed in the NUREG-1137, these systems in question are not credited to meet the requirements of Appendix R for achieving safe-shutdown in the event of a fire. The staff has confirmed that the applicant correctly excluded the above total flooding Halon 1301 fire suppression systems from scope of license renewal and subject to an AMR. Therefore, the staff’s concern described in RAI 2.3.3.19-4 is resolved.

2.3.3.19.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any SCs within the scope of license renewal. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the fire protection system components that are 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).

2.3.3.20 Emergency Diesel Generator System

2.3.3.20.1 Summary of Technical Information in the Application

LRA Section 2.3.3.20 describes the emergency diesel generator (EDG) system, which consists of one diesel generator per safety-related load group complete with its accessories and fuel storage and transfer systems and which generates onsite electric power to feed the standby power system. The standby power system provides alternating current power for safe shutdown of the plant in loss of offsite power. There are two EDGs per unit, each connected exclusively to a single 4.16kV safety feature bus of a load group. Each unit has two 4.16kV Class 1E trains, and the safety-related equipment on both trains is similar. The trains are redundant and for each unit one train is adequate to satisfy minimum ESF demand caused by a LOCA and a simultaneous loss of preferred power supply. The fuel oil storage for each unit is sized for seven days of operation to meet the ESF load plus an additional amount for periodic testing of the diesel generator. The EDG support systems provide stored energy to start the EDGs along with cooling, lubrication, and combustion air intake and exhaust to allow the EDGs to perform their function. The NSCW system supplies cooling water to the EDG jacket water coolers.

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

LRA Table 2.3.3.20 identifies EDG system component types within the scope of license renewal and subject to an AMR:

- air receivers
- closure bolting
- collection troughs (EDG lube oil leakage)
- eductors - EDG fuel oil ejector assembly
- electric heater housings
- filter housings
- flame arrester elements
- flame arrester housings
- flexible connectors
- flow orifice/elements
- heat exchangers - EDG jacket water HXs (channel heads)
- heat exchangers - EDG jacket water HXs (shells)
- heat exchangers - EDG jacket water HXs (tubes)
- heat exchangers - EDG jacket water HXs (tubesheets)
- heat exchangers - EDG lube oil HXs (channel heads)
- heat exchangers - EDG lube oil HXs (shells)
- heat exchangers - EDG lube oil HXs (tubes)
- heat exchangers - EDG lube oil HXs (tubesheets)

- oil reservoirs - EDG lube oil sumps
- piping components
- pump casings - EDG fuel oil engine-driven pumps
- pump casings - EDG fuel oil storage tank pumps
- pump casings - EDG jacket water chemical addition pumps
- pump casings - EDG jacket water keep-warm pumps
- pump casings - EDG jacket water pumps
- pump casings - EDG lube oil keep-warm pumps
- pump casings - EDG lube oil pumps
- silencers
- strainer elements
- strainer housings
- tanks - EDG fuel oil day tanks
- tanks - EDG fuel oil line leakage tanks
- tanks - EDG fuel oil storage tanks
- tanks - EDG jacket water chem addition tanks
- valve bodies
- vent screens - tank vents

The intended functions of the EDG system component types within the scope of license renewal include:

- protection from debris
- heat exchange between fluid media
- prevention of flame propagation from ignition of vent pipe vapors back to the source
- restriction of process flow
- pressure-retaining boundary

2.3.3.20.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.20 and UFSAR Sections 8.3.1.1.3, 9.5.4 through 9.5.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.20 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 2.3.3.20-1, dated January 28, 2008, the staff noted that drawings 1X4LD170-1, 1X4LD170-2, 2X4LD170-1, and 2X4LD170-2 (G-7) indicate jacket water standpipes that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). The applicant was requested to provide additional information explaining why the standpipes are not listed in LRA Table 2.3.3.20 as a component type subject to an AMR.

In its response, dated February 27, 2008, the applicant stated:

> The Emergency Diesel Generator System jacket water system standpipe is not listed in LRA Table 2.3.3.20 as a separate component type subject to an AMR. However, the standpipes are included in the component type, "Piping Components" as shown in Table 2.3.3.20 Item No. 20 and Table 3.3.2-20 Items 20c, 20d and 20k. The standpipes are vertical, cylindrical piping components constructed of carbon steel; therefore, they have been classified in the LRA as piping components.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-1 acceptable because the applicant provided clarification that the standpipes are included as Item No. 20 "Piping Components" in the AMR tables. Therefore, the staff's concern described in RAI 2.3.3.20-1 is resolved.

In RAI 2.3.3.20-2, dated January 28, 2008, the staff noted that drawings 1X4LD170-1, 1X4LD170-2, 2X4LD170-1, and 2X4LD170-2 (E-6) and as described in the UFSAR Section 9.5.8.2.3 indicate that the housings for the turbocharger and aftercooler form a pressure boundary for intake air going to the engine intake manifolds and should be in scope for license renewal based on criterion 10 CFR 54.4(a)(1). The applicant was requested to provide additional information explaining why the turbocharger/aftercooler housings with their pressure boundary and heat exchange functions are not listed in LRA Table 2.3.3.20 for components subject to an AMR.

In its response, dated February 27, 2008, the applicant stated:

> The turbocharger and after-cooler are skid mounted equipment of the Emergency Diesel Generators assembly and thus considered part of this complex assembly - emergency diesel generator engine. Therefore, no AMR of the housing for these components is required due to the complex active assembly classification of this assembly, i.e., this component/assembly does not meet the AMR criteria for an integrated plant assessment per 10 CFR 54.21(a)(1)(i). Consequently, the turbocharger/aftercooler housings with their pressure boundary and heat exchange functions are not listed in LRA Table 2.3.3.20 for components subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-2 acceptable because the applicant stated that the turbocharger/aftercooler housings are skid mounted equipment of the complex assembly – emergency diesel generator, and do not meet the AMR criteria for an integrated plant assessment per 10 CFR 54.21(a)(1)(i). Therefore the staff's concern described in RAI 2.3.3.20-2 is resolved.

In RAI 2.3.3.20-3, dated January 28, 2008, the staff noted that drawings 1X4LD170-1, 1X4LD170-2, 2X4LD170-1, and 2X4LD170-2 (E-3) and (B-3) indicate that manhole covers which provide a pressure boundary for the diesel fuel oil day and storage tanks are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). The applicant was requested to provide additional information explaining why the manhole covers are not listed in LRA Table 2.3.3.20 for components subject to an AMR.

In its response, dated February 27, 2008, the applicant stated:

> Tank manways were not identified as a separate component type for tanks in mechanical systems. The manways for the diesel fuel oil day and fuel oil storage tanks were included as part of the tank. In the LRA Table 2.3.3.20, the manway covers for the diesel fuel oil day and storage tanks are covered under Item 31 and 33 respectively.
>
> In the LRA Table 3.3.2-20, the AMR of the diesel fuel oil day tank manways are covered by Items 31a and 31c. The AMR of the diesel fuel oil storage tank manways and covers are covered by Items 33a and 33c of this table as well.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-3 acceptable, because the applicant provided clarification that the manway covers for the diesel fuel oil day and storage tanks are considered an integral part of the tank components listed in the AMR tables. Therefore, the staff's concern described in RAI 2.3.3.20-3 is resolved.

In RAI 2.3.3.20-4, dated January 28, 2008, the staff noted that drawings 1X4LD170-1, 1X4LD170-2, 2X4LD170-1, and 2X4LD170-2 locations (H-7), (C-8), (D-2), (C-2), and (E-3) indicate tank vents that are within the scope of license renewal. LRA Table 2.3.3.20 lists tank vent screens as components that provide debris protection for a vent, but none of the vents show a debris screen. The applicant was requested to provide additional information explaining which tank vents on the drawings do or do not have the tank vent screen component that is listed as Item 36 in LRA Table 2.3.3.20.

In its response, dated February 27, 2008, the applicant stated:

> Vent screens that cover tank vents for debris/ bird protection on the various EDG System atmospheric vents to outdoors have been put in scope. Since no equipment tag numbers apply and no material documentation could be found, the vent screens are assumed to be carbon steel based on the piping material. Piping and instrument diagrams used to develop the referenced LRA boundaries did not show screens for tank vents; although, area physical drawings do identify screen covers for the diesel fuel oil storage tank vents; no screen covers were identified for the diesel fuel oil day tank vents. Since the vents for both tanks provide the same function, it was assumed that screen covers were installed on the diesel fuel day tank vents as well.

By telecom dated April 17, 2008, the applicant was advised that the staff will proceed based on having the screens in place. The applicant acknowledged staff's position and stated that they are planning to inspect the plant in the near future to verify screen installation and screen materials.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.20-4 acceptable, because the applicant stated the screens are in scope and committed to verify screen materials and vents with screens. Therefore, the staff’s concern described in RAI 2.3.3.20-4 is resolved.

In RAI 2.3.3.20-5, dated January 28, 2008, the staff noted that drawings 1X4LD170-1, 1X4LD170-2, and 2X4LD170-1 (D-4) indicate that the concrete vault roof has a vent that is within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). Those drawings cover the diesel generator trains A and B for plant Unit #1 and train A for plant Unit #2. However, drawing 2X4LD170-2 for train B of plant Unit #2 does not show a vent for the concrete vault roof. The applicant was requested to provide additional information explaining why the concrete vault roof vent is missing on drawing 2X4LD170-2 for diesel generator plant Unit #2 Train B.

In its response, dated February 27, 2008, the applicant stated:

> It has been determined from review of domestic supporting drawings that the concrete vault roof vent missing on drawing 2X4LD170-2 is an error and the vent should be shown as on 2X4LD170-1.
>
> The diesel fuel oil storage tank pump house forming plans sections and details show the roof vents for both trains of both units.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.20-5 acceptable, because the applicant provided clarification that the concrete vault roof vent was missing from drawing 2X4LD170-2 in error and should be shown and in scope for license renewal. Therefore, the staff’s concern described in RAI 2.3.3.20-5 is resolved.

In RAI 2.3.3.20-6, dated January 28, 2008, the staff noted that drawing 2X4LD170-2 (F/G-6) indicates the 343-3/4" pipeline and associated drain are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). However, drawings 1X4LD170-1, 1X4LD170-2, and 2X4LD170-1 for the same location indicates that the similar 343-3/4" and 339-3/4" pipelines are within the scope of license renewal based on criterion 10 CFR 54.4(a)(2), rather than 10 CFR 54.4(a)(1), and the drain is not within the scope of license renewal. The applicant was requested to provide additional information to define the correct criterion to use for all four of these drawings for the 343-3/4" and 339-3/4" drain pipelines and their respective drains.

In its response, dated February 27, 2008, the applicant stated:

> License renewal drawing 2X4LD170-2 (F/G-6) inadvertently shows the 343-3/4" pipeline and associated drain within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). This pipeline 343-3/4" is within the scope of license renewal based on criterion 10 CFR 54.4(a)(2), rather than 10 CFR 54.4(a)(1) which is the same in scope bases as pipeline 339-3/4" shown on 2X4LD170-2 (F/G-6). These lines function as drain piping from the diesel generator spill collection trough and are classified as non-safety related.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-6 acceptable because the applicant provided clarification that the 343-3/4" pipeline on drawing 2X4LD170-2 (F/G-6) should have been shown in scope for criterion 10 CFR 54.4(a)(2), rather than criterion 10 CFR 54.4(a)(1). Therefore, the staff's concern described in RAI 2.3.3.20-6 is resolved.

In RAI 2.3.3.20-7, dated January 28, 2008, the staff noted that drawing 2X4LD170-1 (C/D-8), indicates a lube oil press fill pipeline located outside the engine piping boundary and connected to a three-inch pipeline within the engine piping boundary that is entirely within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). However, drawings 1X4LD170-1, 1X4LD170-2, and 2X4LD170-2, for the same general location and pipeline characteristics, indicate the lube oil press fill piping is not within the scope of license renewal. The applicant was requested to provide additional information to define the correct criterion to be applied to the lube oil press fill pipeline outside the engine piping boundary on all four drawings referenced above.

In its response, dated February 27, 2008, the applicant stated:

> Per review of the License Renewal drawing 2X4LD170-1 at (C/D-8) regarding scoping of the lube oil press fill pipeline, the boundary line for this pipeline should have been shown as red not gray for drawings 1X4LD170 -1 & 2 and 2X4LD170-2. The lube oil press fill piping is within the scope of license renewal based on criterion 10 CFR 54.4(a)(1).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-7 acceptable because the applicant provided clarification that the lube oil press fill pipelines on drawings 1X4LD170 –1 &2 and 2X4LD170-2 are in scope for criterion 10 CFR 54.4(a)(1). Therefore, the staff's concern described in RAI 2.3.3.20-7 is resolved.

In RAI 2.3.3.20-8, dated January 28, 2008, the staff noted that drawing 2X4LD170-1 (E-8) shows sections of 037-10" and 035-10" piping within the scope of license renewal based on criterion 10 CFR 54.4(a)(2) with a continuation to drawing 2X4LD135-1 (G-6). The continuation location G-6 on drawing 2X4LD135-1 indicates the 037-10" and 035-10" piping are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). It appears that the sections of 037-10" and 035-10" piping shown on drawing 2X4LD170-1 between the engine piping boundary and the continuation marker to drawing 2X4LD135-1 should also be in-scope based on criterion 10 CFR 54.4(a)(1) as are the other emergency diesel generators shown in LR drawings 2X4LD170-2, 1X4LD170-1, and 1X4LD170-2. The applicant was requested to provide additional information clarifying why the subject piping on drawing 2X4LD170-1 (E-8) meets the requirements of criterion 10 CFR 54.4(a)(2), rather than 10 CFR 54.4(a)(1).

In its response, dated February 27, 2008, the applicant stated:

> From a review of the drawings 2X4LD170-1 and 2X4LD135-1 and a re-visit of the 10 CFR 54.4(a)(1) criterion against the function of the pipelines, 037-10" and 035-10", it is concluded that the sections of piping shown on drawing 2X4LD170-1 between the engine piping boundary and the continuation marker to drawing 2X4LD135-1 are in-scope based on criterion 10 CFR 54.4(a)(1), and should have been indicated as the

other pipelines are for this function shown on LR drawings 2X4LD170-2, 1X4LD170-1, and 1X4LD170-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-8 acceptable because the applicant provided clarification that on drawing 2X4LD170-1 the sections of 037-10" and 035-10" pipelines between the engine piping boundary and the continuation marker to drawing 2X4LD135-1 should have been in scope for criterion 10 CFR 54.4(a)(1). Therefore, the staff's concern described in RAI 2.3.3.20-8 is resolved.

2.3.3.20.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the emergency diesel generator 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).

2.3.3.21 Demineralized Water System

2.3.3.21.1 Summary of Technical Information in the Application

LRA Section 2.3.3.21 describes the demineralized water (DW) system, which stores and delivers deionized water to various plant systems. Demineralized water is not required for any safety-related function.

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

LRA Table 2.3.3.21 identifies DW system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- piping components
- piping components - pipe spools for startup strainers
- pump casings - demineralized water transfer booster pumps
- valve bodies

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

2.3.3.21.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.21 and UFSAR Section 9.2.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.21 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.

In RAI 2.3.3.21-1, dated January 28, 2008, the staff noted drawing AX4LD190-2 (E-3) shows pipe section 172-1" in-scope for 10 CFR 54.4(a)(2). The continuation to AX4LD123-2 (A-6) is not shown as in-scope for license renewal. The applicant was asked to provide additional information detailing the license renewal boundary for pipe section 172-1" on drawing AX4LD123-2 (A-6).

In its response, dated February 27, 2008, the applicant stated:

> The segment of line A-1210-172-1" which appears on mechanical boundary drawing AX4LD123-2 was inadvertently not shown as being in scope for 10 CFR 54.4(a)(2). This line segment is in scope for 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1 acceptable because the applicant explained that the piping in question is within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.21-1 is resolved.

2.3.3.21.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the DW 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).

2.3.3.22 Hydrogen Recombiner and Monitoring System

2.3.3.22.1 Summary of Technical Information in the Application

LRA Section 2.3.3.22 describes the hydrogen recombiner and monitoring system, which was installed to monitor and control post-accident containment hydrogen. The applicant intends to downgrade the recombiners to nonsafety-related and to abandon them in place. The hydrogen monitors also will be downgraded to nonsafety-related; however, piping for these monitors penetrating containment has a containment integrity safety function. Until these CLB changes are processed, these components are within the scope of license renewal as safety-related.

The hydrogen recombiner and monitoring system contains safety-related components relied upon to remain functional during and following DBEs. In addition, the hydrogen recombiner and monitoring system performs functions that support EQ.

LRA Table 2.3.3.22 identifies hydrogen recombiner and monitoring system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- hydrogen recombiner (containment) housings
- piping components
- valve bodies

The intended functions of the hydrogen recombiner and monitoring system component types within the scope of license renewal include:

- spray shield or curbs for flow direction
- pressure-retaining boundary

2.3.3.22.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.22 and UFSAR Section 6.2.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.22.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the hydrogen recombiner and monitoring 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).

2.3.3.23 Drain Systems

2.3.3.23.1 Summary of Technical Information in the Application

LRA Section 2.3.3.23 describes the drain systems, which consist of collection piping, valves, equipment drains, floor drains, vents, seals, cleanouts, oil and sediment interceptors, acid neutralization tanks, collection sumps, sump pumps, and collection tanks with discharge pumps, piping, and valves.

The drains within the scope of license renewal include the following systems:

- containment and auxiliary building drain system – radioactive
- auxiliary building drain system – nonradioactive
- auxiliary building flood-retaining rooms, alarms, and drains
- control building drain system
- fuel-handling building drains
- sanitary waste and vent
- turbine building drain system

The containment and auxiliary building drain system - radioactive is designed to drain water in the containment building and tritiated water in the other buildings. Water drained into the system enters the plant liquid waste processing system for recycling or disposal.
The auxiliary building drain system – nonradioactive drains normally nonradioactive equipment and floor liquid waste from open areas of the auxiliary building to the floor drain tank via the auxiliary building sump or the penetration room sump. This system also includes miscellaneous drains that convey fluids to other sumps and empty or drain the sumps.

The auxiliary building flood-retaining rooms, alarms, and drain system prevents drain or flood water from backing up into selected important auxiliary building rooms. The system retains post-LOCA radioactive liquid leakage within the water-tight flood-retaining rooms up to the maximum expected flood level by water-tight doors evaluated as parts of component supports and bulk commodities (LRA Section 2.4.12).

The control building drain system collects water from fire protection sprinklers in the control building, equipment building, technical support center, and connected electrical tunnels as well as from incidental leaks. The system routes water to a sump below the control building. Sump pumps transfer the water to the turbine building oil separator. The system also provides an alternate route to the waste monitor tank in the auxiliary building for processing radioactive liquid.

The fuel-handling building drainage system collects water in the fuel-handling building drain sump from drains within the building. Fuel-handling building drain sump pumps transfer water from the building's drain sump to the waste monitor tank for processing or disposal.

The sanitary waste and vent system provides plumbing drains and vents for toilets, locker rooms, showers, and janitor rooms in the control and turbine buildings.

The turbine building drain system removes all liquid wastes from the turbine building for disposal to the waste water effluent system. This system also monitors and, if necessary, removes radioactive contaminants from these wastes if radioactive material appears in the drains from a tube leak in one of the steam generators. Filters and demineralizers that remove radioactive contaminants from wastes processed by this system are located in the auxiliary building.

The drain systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the drain systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the drain systems perform functions that support EQ.

LRA Table 2.3.3.23 identifies drain systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- drain bodies
- floor drain plugs
- piping components
- pump casings - CCW drain tank pumps
- tanks - acid neutralizing sumps
- valve bodies

The intended function of the drain systems component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.23.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.23 and UFSAR Sections 9.3.3 and 11.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During its review of the sanitary waste and vent and the turbine building drain systems, 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 component types with intended functions delineated under 10 CFR 54.4(a).

During its review of the remaining drain systems, 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.23 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. In addition to the RAI 2.3.3.23-1 related to drawing continuation errors discussed in Section 2.3.3, the applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.23-2, dated January 28, 2008, the staff noted that drawings 1X4LD145-6 and 2X4LD145-6 (B-2) show pipe 256-4" as not within the scope of license renewal. Drawings 1X4LD145-5 and 2X4LD145-5 (D-4) show pipe 256-4" within the scope of license renewal based on criterion 10 CFR 54.4(a)(2). The applicant was requested to provide additional information clarifying why pipe 256-4" on drawings 1X4LD145-6 and 2X4LD145-6 (B-2) is not within the scope of license renewal.

In its response, dated February 27, 2008, the applicant stated:

> Line 1215-256-4" as shown on drawings 1X4LD145-6 and 2X4LD145-6 is in scope for 10 CFR 54.4(a)(2). Drawings 1X4LD145-6 and

> 2X4LD145-6 should have shown this line highlighted as in scope for 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-2 acceptable because the applicant provided clarification that line 1215-256-4" on drawings 1x4LD145-6 and 2X4LD145-6 should have been shown highlighted as in scope for 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.3.23-2 is resolved.

In RAI 2.3.3.23-3, dated January 28, 2008, the staff noted that drawings 1X4LD179-2 and 2X4LD179-2 (D-7) show pipeline 097-2" within the scope of license renewal based on criterion 10 CFR 54.4(a)(2) continuing to drawings 1X4LD124-2 (F-4) and 2X4LD124-2 (G-4). Drawings 1X4LD124-2 and 2X4LD124-2 could not be located in the boundary drawing package. The applicant was requested to provide additional information to verify that the continuation from drawings 1X4LD179-2 and 2X4LD179-2 has been made to the correct drawings and locations and provide the drawings.

In its response, dated February 27, 2008, the applicant stated:

> Line 1407-097-2" on drawings 1X4LD179-2 and 2X4LD179-2 continues to P&ID AX4DB124-2. P&ID AX4DB124-2 shows the point where this line exits the Auxiliary Building into the Radwaste Transfer Tunnel. There are no safety related components in the Radwaste Transfer Tunnel, so potential spatial interactions are not a concern and the in-scope portion of the line ends at the Auxiliary Building to Radwaste Transfer Tunnel boundary. However, P&ID AX4DB124-2 was not redrawn into a license renewal mechanical boundary drawing. To resolve this discrepancy, mechanical boundary drawings 1X4LD179-2 and 2X4LD179-2 should have been revised to include the Auxiliary Building to Radwaste Transfer Tunnel boundary for clarity.

By telecom dated April 17, 2008, the applicant verified that there were no new component types within the boundary for which the drawings were not provided.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.23-3 acceptable because the applicant provided clarification that the license renewal boundary ends at the Auxiliary Building to Radwaste Transfer Tunnel boundary and stated that there were no new component types within the boundary for which drawings were not provided. Therefore, the staff's concern described in RAI 2.3.3.23-3 is resolved.

2.3.3.23.3 Conclusion

For the sanitary waste and vent and the turbine building drain systems, the staff reviewed the LRA and the UFSAR to determine whether the applicant failed to identify any component types that are typically found within the scope of license renewal and finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the sanitary waste and vent and the turbine building drain systems component types within the scope of license renewal, as required by 10 CFR 54.4(a).

For the remaining drain systems, the staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the

- containment and auxiliary building drain system – radioactive,
- auxiliary building drain system – nonradioactive,
- auxiliary building flood-retaining rooms, alarms, and drains,
- control building drain system, and
- fuel-handling building drains

as 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).

2.3.3.24 Potable and Utility Water Systems

2.3.3.24.1 Summary of Technical Information in the Application

LRA Section 2.3.3.24 describes the potable and utility water systems. The potable water system chemically treats, stores, and distributes well water for drinking to the units. The utility water system provides water for general washdown purposes at utility stations throughout the plant (nonradioactive process areas). Utility water also serves for sump pump bearing lubrication and miscellaneous cooling purposes (*e.g.*, cooling of the steam generator blowdown samples).

The failure of nonsafety-related SCs in the potable and utility water systems could potentially prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.24 identifies potable and utility water systems component types within the scope of license renewal and subject to an AMR:

- arresters (water hammer)
- closure bolting
- piping components
- pump casings - hot water recirculation pumps
- strainer housings
- valve bodies
- water heater housings and jackets

The intended functions of the potable and utility water systems component types within the scope of license renewal include:

- spray shield or curbs for flow direction
- pressure-retaining boundary

2.3.3.24.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.24 and UFSAR Section 9.2.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 component types with intended functions delineated under 10 CFR 54.4(a).

2.3.3.24.3 Conclusion

The staff reviewed the LRA and the UFSAR to determine whether the applicant failed to identify any component types that are typically found within the scope of license renewal and finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the potable and utility water systems component types within the scope of license renewal, as required by 10 CFR 54.4(a).

2.3.3.25 Radiation Monitoring System (1609)

2.3.3.25.1 Summary of Technical Information in the Application

LRA Section 2.3.3.25 describes the radiation monitoring system, which monitors radiation levels in the process flow streams of plant fluid systems, measures direct gamma radiation, and provides corresponding indications, recordings, alarms, and controls. For normally radioactive fluid systems with direct or diluted discharge paths to the surrounding environment, the radiation monitoring system actuation functions limit further discharge if activity concentrations exceed preset levels. The system also provides information for detecting and monitoring RCS leakage.

Radiation monitors fall into five functional classifications:

- process monitors, which determine concentrations of radioactive material in plant fluid systems. The primary-to-secondary leak detection monitors (N16 and noble gas leak rate detectors) are included in this category.
- effluent monitors, which measure radioactivity discharged to the environs
- airborne monitors, which provide operator information on airborne concentrations of radioactive gases and particulate radioactivity at various points in the ventilation ducts
- area monitors, which provide operator information on external gamma radiation levels at fixed points throughout the plant
- post-accident (or high-range) monitors designed to assess and follow potential pathways for release of radioactive materials during accident conditions

The radiation monitors themselves are instrumentation components and therefore are addressed in the scoping and screening for the electrical and instrumentation and controls systems (LRA Section 2.5). Mechanical aspects (*e.g.;* process line components) are addressed in the mechanical scoping and screening.

The radiation monitoring system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the radiation monitoring system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the radiation monitoring system performs functions that support EQ.

LRA Table 2.3.3.25 identifies radiation monitoring system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping components
- valve bodies

The intended function of the radiation monitoring system component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.25.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.25 and UFSAR Sections 11.5 and 12.3.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.25 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.

In RAI 2.3.3.25-1, dated January 28, 2008, the staff noted that drawings 1X4LD133-1, 1X4LD133-2, 2X4LD133-1, and 2X4LD133-2 (H-3), and drawings 1X4LD136 and 2X4LD136 (A-3) and (E-3) show radiation monitors that are identified as in scope for license renewal based on criterion 10 CFR 54.4(a)(2). Each radiation monitor is connected to 1 inch sensing lines identified as within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). Also, the staff noted that for similar equipment on drawings 1X4LD213-2 and 2X4LD213-2 (D-1) radiation monitors are within the scope of license renewal based on criterion 10 CFR 54.4(a)(2) but have equivalent anchors on each end. The applicant was requested to provide additional information explaining why the radiation monitors on drawings 1X4LD133-1, 1X4LD133-2, 1X4LD136, 2X4LD133-1, 2X4LD136, and 2X4LD133-2 are not within the scope of license renewal based on criterion 10 CFR 54.4(a)(1) as are the connecting pipe sections.

In its response, dated February 27, 2008, the applicant stated:

> The radiation monitors on mechanical boundary drawings 1X4LD133-1, 1X4LD133-2, 1X4LD136, 2X4LD133-1, 2X4LD136, 2X4LD133-2, 1X4LD213-2 and 2X4LD213-2 are not in scope for 10 CFR 54.4(a)(1) scoping criteria because they do not ensure the integrity of the reactor coolant pressure boundary; ensure the capability to shut down the reactor and maintain it in a safe shutdown condition; or ensure the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposure comparable to the guidelines in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable.
>
> The safety classifications of both the radiation monitors and the connecting pipe sections are established in the current licensing basis in accordance with regulatory guidance. Refer to LRA section 2.1, Scoping and Screening Methodology, for additional discussion.
>
> Also note that the radiation monitors on mechanical boundary drawings 1X4LD213-2 and 2X4LD213-2 do not have equivalent anchors on each end. Boundary endpoint clarification note #4 indicates that the radiation monitors are the equivalent anchors. However, given that there are no piping endpoints at the radiation monitors, it would be more appropriate to describe these radiation monitor packages as non-safety related piping that is connected at both ends to safety related piping. Boundary endpoint clarification note # 4 on mechanical boundary drawings 1X4LD213-2 and 2X4LD213-2 is unnecessary and should not have been included.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.25-1 acceptable because the in scope classification of the radiation monitor and sensing lines are consistent with the plant licensing bases. Therefore, the staff's concern described in RAI 2.3.3.25-1 is resolved.

2.3.3.25.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the radiation monitoring 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).

2.3.3.26 Reactor Makeup Water Storage System

2.3.3.26.1 Summary of Technical Information in the Application

LRA Section 2.3.3.26 describes the reactor makeup water storage system (RMW), which supplies recycled and deaerated demineralized water to safety-related surge tanks. This system also supplies water to the boric acid mixing tee for daily use as an RCS diluent and to various gas strippers, pumps, tanks, and pipelines for cleaning and flushing operations. It is an assured seismic Category I make-up source to the spent fuel pool and an assured backup seismic Category I makeup source to the CCW and ACCW surge tanks. The reactor makeup water storage tank degasifier recirculates and degasifies the demineralized water to reduce the oxygen content to primary plant usage specifications.

The reactor makeup water storage tanks are constructed of concrete with a stainless steel liner. The tank liner is evaluated in this section as a mechanical component. The concrete shell, roof, and base slab are evaluated in the structural scoping for the concrete tank and valve house structures (LRA Section 2.4.7). The reactor makeup water storage tanks have floating diaphragms which minimize oxygen absorption.

The reactor makeup water storage system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the reactor makeup water storage system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.26 identifies reactor makeup water storage system component types within the scope of license renewal and subject to an AMR. The intended functions of the reactor makeup water storage system component types within the scope of license renewal include:

- restriction of process flow
- physical integrity maintenance to prevent generation of debris or loose parts which could interfere with a safety-related function
- pressure-retaining boundary

2.3.3.26.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.26 and UFSAR Section 9.2.7 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.26 identified areas in which additional information was necessary to complete the review of the applicant's scoping and screening results. In addition to RAI 2.3.3.26-1 related to drawing continuation errors described in Section 2.3.3, the applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.26-2, dated January 28, 2008, the staff noted drawing 1X4LD184 (C-8) shows a drawing continuation of 163-1" piping, within the scope of license renewal based on criterion 10 CFR 54.4(a)(2), to drawing 1X4LD129 (G-6). Part of the 163-1" piping on

1X4LD129 (G-6) to In-Scope Boundary Endpoint Clarification Symbol A11 is shown as not in scope for license renewal. The applicant was asked to provide additional information justifying the boundary locations.

In its response, dated February 27, 2008, the applicant stated:

> Mechanical boundary drawing 1X4LD129 shows that the in scope portion of line 1228-163-1" ends at an anchor, and refers to endpoint clarification Note #11. Note #11 indicates that the pipe is in scope for attached pipe considerations up to the identified anchor. Note #11 also states that the spatial interaction boundary extends beyond the identified anchor. No endpoint should have been shown at this location. Where spatial interaction concerns bound the attached anchor endpoint, the line should have been shown as in scope all the way to the spatial interaction endpoint.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.26-2 acceptable because the applicant explained that the entire piping between the anchor A11 and the spatial interaction endpoint is in scope for license renewal. Therefore, the staff’s concern described in RAI 2.3.3.26-2 is resolved.

In RAI 2.3.3.26-3, dated January 28, 2008, the staff noted drawing 1X4LD129 (H-2) shows pipe section 172-1" splits and connects to a 172-3/4" line and a 172-1" line. The drawing also shows that part of the 172-1" line before the split, as well as the 172-3/4" line, as nonsafety-related and within the scope of license renewal for spatial effects. Yet no portion of the continuing 172-1" line that is connected to the catalytic hydrogen re-combiner is within the scope of license renewal. The applicant was asked to provide additional information to clarify why this line is not included in the scope of license renewal as per requirements of 10 CFR 54.4(a)(2).

In its response, dated February 27, 2008, the applicant stated:

> On mechanical boundary drawing 1X4LD129 the Reactor Makeup Water (RMW) System piping was put in scope up to the boundaries of that system. After additional review of this drawing, the RMW System boundaries do not clearly coincide with 10 CFR 54.4(a)(2) endpoints as defined in NEI 95-10, Appendix F. The mechanical boundary drawings 1X4LD129 and 2X4LD129 should have shown the RMW System piping to the catalytic hydrogen recombiners as in scope for 10 CFR 54.4(a)(2) up to the connections to the recombiners. The catalytic hydrogen recombiners are already in scope for 10 CFR 54.4(a)(2) as equivalent anchors.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.26-3 acceptable because the applicant explained that the mechanical boundary drawings 1X4LD129 and 2X4LD129 should have shown the RMW System piping to the catalytic hydrogen recombiners as in scope for 10 CFR 54.4(a)(2) up to the connections to the recombiners. Therefore, the staff’s concern described in RAI 2.3.3.26-3 is resolved.

2.3.3.26.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the reactor makeup water storage 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).

2.3.3.27 Sampling Systems

2.3.3.27.1 Summary of Technical Information in the LRA

LRA Section 2.3.3.27 describes the sampling systems, which consists of the following:

- nuclear sampling system - liquids
- nuclear sampling system - gaseous
- turbine plant sampling system
- post-accident sampling system

The nuclear sampling system – liquids supplies representative process liquid samples to the for laboratory analysis to guide operation of the RCS, the RHR system, safety injection system, waste processing system, and CVCS. The nuclear sampling system – liquids is for manual operation and has no emergency function; however, certain valves in the system have a containment isolation function, and lines which penetrate containment are relied upon for containment integrity.

The nuclear sampling system – gaseous supplies representative process stream gas samples for laboratory analysis from the CVCS and gaseous waste and boron recycle systems as required to support plant operation. The nuclear sampling system – gaseous is for manual operation only during periods of normal plant operation.

The turbine plant sampling system collects, cools, analyzes, controls, alarms, and records water quality from various sampling points in the secondary plant systems. The system monitors water samples from the steam generator blowdown lines, the turbine cycle, and the circulating water system to control water chemistry and permit appropriate corrective action.

The post-accident sampling system takes and returns post-accident containment atmosphere samples via system piping and skid-mounted equipment. The original system design included the capability, now eliminated, to obtain fluid samples from the RCS and the containment sumps. Post-accident fluid samples from the RCS and the containment sumps can be obtained by the nuclear sampling system – liquids. Certain system lines and valves are relied upon for containment isolation and integrity.

The sampling systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the sampling systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the sampling systems perform functions that support SBO and EQ.

LRA Table 2.3.3.27 identifies sampling systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- corrosion product monitors (shells and heads)
- filter housings
- flow orifice/elements
- piping components
- pump casings - SGBD sample pumps
- rotameter housings
- sample baths - steam generator blowdown bath (shells)
- sample coolers - primary and secondary-side samples (shells and end plates)
- strainer housings
- valve bodies

The intended functions of the sampling systems component types within the scope of license renewal include:

- restriction of process flow
- pressure-retaining boundary

2.3.3.27.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.27 and UFSAR Section 9.3.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.27 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 2.3.3.27-1, dated January 28, 2008, the staff noted that drawing 2X4LD171-8 (E-5), turbine plant sampling system, pipe section 139-1½" downstream of valve 094 is shown as not within the scope of license renewal for criterion 10 CFR 54.4(a)(2). While drawing 1X4LD171-8 (E-5), Turbine Plant Sampling System, shows this piping within the scope of license renewal. The applicant was asked to provide additional information to justify the omission of the 2X4LD171-8 pipe section 139-1½" from the applicable requirements of 10 CFR 54.4(a)(2) and provide the license renewal boundary for 139-1½".

In its response, dated February 27, 2008, the applicant stated:

> Line 1305-139-1½" downstream of valve 094 on mechanical boundary drawing 2X4LD171-8 was inadvertently omitted from scope. This drawing should have shown all of line 1305-139-1½" in scope for 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.27-1 acceptable because the applicant explained that the piping in question is within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.27-1 is resolved.

In RAI 2.3.3.27-2, dated January 28, 2008, the staff noted that drawings 1X4LD171-8 and 2X4LD171-8 have 16 within the scope of license renewal to not within the scope of license renewal transitions identified for 3/8" piping downstream of the steam generator main steam sample coolers that meets the 10 CFR 54.4(a)(2) criterion. There is not enough information provided to identify the transition location. The applicant was asked to provide additional information to identify these LR boundaries and to justify the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a)(2) for the following locations on both drawings:

> Location D-3, downstream of valve 008.
> Location E-3, downstream of valve 007.
> Location F-3, downstream of valve 006.
> Location G-3, downstream of valve 005.
> Location D-6, downstream of valve 010.
> Location E-6, downstream of valve 011.
> Location F-7, downstream of valve 012.
> Location G-8, downstream of valve 009.

In its response, dated February 27, 2008, the applicant stated:

> The sample lines described above are shown as in scope for 10 CFR 54.4(a)(2) criteria up to the point where they exit from the Auxiliary Building into Main Steam and Feedwater Tunnel 1T1 (2T1 on Unit 2). The sample lines downstream of the sample coolers are only in scope for potential spatial interaction effects. There are no safety related systems or components in Tunnels 1T1 or 2T1, therefore the 10 CFR 54.4(a)(2) spatial interaction criteria do not apply once the sample lines have exited the Auxiliary Building. Refer to the answer to RAI 2.1-2 for non-safety related components in the Turbine Building.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.27-2 acceptable because the applicant explained why these sample lines are not in scope. Therefore, the staff’s concern described in RAI 2.3.3.27-2 is resolved.

In RAI 2.3.3.27-3, dated January 28, 2008, the staff noted that drawings 1X4LD110 and 2X4LD110 (F-8), Post Accident Sampling System, show the piping associated with penetration 86C as not within the scope of license renewal based on criterion 10 CFR 54.4(a). The applicant was asked to provide additional information to justify the omission of this piping from the applicable requirements of 10 CFR 54.4(a).

In its response, dated February 27, 2008, the applicant stated:

> Line 2702-008-1" which is associated with penetration 86C on mechanical boundary drawings 1X4LD110 and 2X4LD110 is in scope. These drawings should have shown line 2702-008-1" in scope for 10 CFR 54.4(a)(1).

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.27-3 acceptable because the applicant explained that the piping in question is within the scope of license renewal. Therefore, the staff’s concern described in RAI 2.3.3.27-3 is resolved.

2.3.3.27.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 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).

2.3.3.28 Auxiliary Gas Systems

2.3.3.28.1 Summary of Technical Information in the Application

LRA Section 2.3.3.28 describes the auxiliary gas systems, which include the auxiliary gas system - nitrogen and the auxiliary gas system - hydrogen.

The auxiliary gas system-nitrogen supplies nitrogen for pressurizing, blanketing, and purging of various plant components.

The auxiliary gas system-hydrogen supplies hydrogen to the generator for cooling, to the CVCS for oxygen scavenging, and to the waste gas decay tanks and the reactor coolant drain tanks.

The auxiliary gas systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the auxiliary gas systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the auxiliary gas systems perform functions that support EQ.

LRA Table 2.3.3.28 identifies auxiliary gas systems component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping components
- valve bodies

The intended function of the auxiliary gas systems component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.28.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.28 and UFSAR Section 9.3.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During its review of the auxiliary gas system - nitrogen, 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review of the auxiliary gas system – hydrogen, the staff evaluated the system functions described in the LRA and the UFSAR to verify that the applicant has not omitted from the scope of license renewal any component types with intended functions delineated under 10 CFR 54.4(a).

2.3.3.28.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the auxiliary gas system - nitrogen 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 reviewed the LRA and UFSAR associated with the auxiliary gas system – hydrogen to determine whether the applicant failed to identify component types that are typically found within the scope of license renewal and finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the auxiliary gas system – hydrogen component types within the scope of license renewal, as required by 10 CFR 545.4(a).

2.3.3.29 Chilled Water Systems

2.3.3.29.1 Summary of Technical Information in the Application

LRA Section 2.3.3.29 describes the chilled water systems, which consist of the following:

- normal chilled water system
- essential chilled water system
- special chilled water system

The normal chilled water system supplies chilled water throughout the plant to all air-conditioning and air cooling units required during normal plant operation. Each unit's system also can be connected to supply chilled water for use in one containment building auxiliary air cooling unit and one reactor cavity cooling unit during refueling outages.

The essential chilled water system supplies chilled water to the cooling coils of the various ESF rooms or areas, including battery rooms, switchgear rooms, control rooms, ESF pump rooms, penetration areas, and the spent fuel pool heat exchanger and pump rooms. Both trains of essential chilled water actuate automatically upon either a safety injection signal or control room isolation signal; however, in a loss of offsite power system actuation is manual. Power for each essential chilled water train is by the emergency bus for the equipment it cools.

The special chilled water system supplies the necessary cooling water to air-cooling systems for the onsite technical support center and the standby central alarm station.

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

LRA Table 2.3.3.29 identifies chilled water systems component types within the scope of license renewal and subject to an AMR:

- air separator
- closure bolting
- electric heater housings
- essential chillers - condenser (channel heads)
- essential chillers - condenser (shells)
- essential chillers - condenser (tubes)
- essential chillers - condenser (tubesheets)
- essential chillers - evaporator (channel heads)
- essential chillers - evaporator (shells)
- essential chillers - evaporator (tubes)
- essential chillers - evaporator (tubesheets)
- flow orifice/elements
- oil reservoirs - chiller compressors
- piping components
- piping components - pipe spools for startup strainers
- pump casings - chilled water pumps
- pump casings - chiller motor driver oil pumps
- sight glasses
- strainer elements

- strainer housings
- tanks - chilled water chemical feed pots
- tanks - chilled water expansion tanks
- tanks - chiller economizers
- valve bodies

The intended functions of the chilled water systems component types within the scope of license renewal include:

- protection from debris
- heat exchange between fluid media
- restriction of process flow
- pressure-retaining boundary

2.3.3.29.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.29, and UFSAR Section 9.2.9, and UFSAR Table 3.2.2-1 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.29 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 2.3.3.29-1, dated January 28, 2008, the staff noted that drawings 1X4LD233, 2X4LD233, 1X4LD234, and 2X4LD234 show numerous essential chilled water cooling coils that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). Also, drawings AX4LD231 and AX4LD232 show numerous normal chilled water cooling coils that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(2). The applicant was requested to provide additional information explaining why the cooling coil component type was omitted from LRA Table 2.3.3.29 for components subject to an AMR.

In its response, dated February 27, 2008, the applicant stated:

> The cooling coil component type(s) are included within the LRA ventilation system which corresponds to their associated component tag number. For instance, essential and normal chilled water cooling coil component types are included in the control and auxiliary building ventilation component type tables, 2.3.3.11 and 2.3.3.12, respectively. Therefore, the component types were not duplicated in the chilled water system Table 2.3.3.29.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.29-1 acceptable because the applicant explained that the essential and normal chilled water cooling coil component types are included in the control and auxiliary building ventilation component tables, 2.3.3.11 and 2.3.3.12 respectively. Therefore, the staff's concern described in RAI 2.3.3.29-1 is resolved.

In RAI 2.3.3.29-2, dated January 28, 2008, the staff noted that the license renewal AMR Table 2.3.3.29 did not include some of the typical components that are listed in AMR tables of other plant LRAs, including the housings for the chiller compressor/motor, compressor oil cooler, oil filter, oil pump, and the refrigerant dryer filter. The applicant was requested to provide additional information to explain why these components are not included in LRA Table 2.3.3.29 as components subject to an AMR.

In its response, dated February 27, 2008, the applicant stated:

> The chiller compressor oil is cooled as the lube oil piping passes through the refrigerant filled motor, therefore the chiller compressor does not have a separate sub-component which functions as an oil cooler.
>
> The oil pump is listed in LRA Table 2.3.3.29, Item No. 17, as "Pump Casings - Chiller Motor Driven Oil Pumps."
>
> The chiller compressor housings, chiller compressor lube oil filters, and refrigerant filter dryers were omitted from the application and will be added to LRA Table 2.3.3.29. In addition, the chiller compressor purge tanks were omitted from the application and will be added to LRA Table 2.3.3.29.
>
> LRA Table 3.3.2-29 will be revised to include AMR results for the chiller compressor housings, chiller compressor lube oil filters, refrigerant filter dryers, and chiller compressor purge tanks. In addition, LRA Table 3.3.2-29 will be revised to include AMR results for the following components in the chiller compressor lube oil and refrigerant sub-systems that were not included in the initial AMR results:
>
> - Closure Bolting (copper alloy)
> - Flow Orifice / Elements
> - Piping Components
> - Sight Glasses
> - Strainer Elements
> - Strainer Housings
> - Valve Bodies

Based on its review, the staff finds the applicant's response to RAI 2.3.3.29-2 acceptable because the applicant explained that LRA AMR Tables 2.3.3.29 and 3.3.2-29 would be updated to include missing components that were not included in the initial AMR results. Therefore, the staff's concern described in RAI 2.3.3.29-2 is resolved.

2.3.3.29.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components 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 the applicant has adequately identified the chilled 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).

2.3.3.30 Waste Management Systems

2.3.3.30.1 Summary of Technical Information in the Application

LRA Section 2.3.3.30 describes the waste management systems, which include the following:

- backflushable filter system
- condensate cleanup system
- waste processing system, liquid
- waste processing system, gas

The backflushable filter system consists of two major subsystems which filter and transport radioactive crud:

- backflushable filters subsystem for filtering crud during normal operation in the CVCS, boron recycle system, liquid waste processing system, spent fuel cooling and purification system, and steam generator blowdown system

- crud collection subsystem consisting of a backflushable filter crud tank (equipped with a sprayball) and two crud tank pumps which collect and transport the crud solution to the radwaste solidification system or alternate radwaste building for disposal.

The backflushable filter system is nonsafety-related, intermittent during infrequent filter backflushing operations, and isolated most of the time.

The condensate cleanup system maintains the required purity of feedwater for the steam generators by filtration to remove corrosion products, ion exchange to remove condenser leakage impurities, or both filtration and ion exchange.

The condensate cleanup system consists of the condensate filter demineralizer, the backwash recovery, the spent resin disposal, and the spent resin dewatering systems, all of which are retired in place.

The condensate polishing system is included in the condensate cleanup system. The condensate polishing system (full-flow condensate filter/demineralizers) filters suspended corrosion products from the condensate and removes ionic contaminants to minimize localized corrosion in the steam generator, turbine, and feedwater systems.

The waste processing system, liquid controls, collects, processes, handles, stores, and disposes of liquid radioactive waste generated by normal operation, including anticipated operational occurrences. This system has three subsystems that perform the following activities:

- the recycle subsystem processes reactor grade water entering the system via equipment leaks and drains, valve leakoffs, pump seal leakoffs, tank overflows, and other tritiated water sources and makes it available for reuse in the plant

- the liquid waste subsystem collects and processes nonreactor-grade liquid wastes, including wastes from floor drains, equipment drains for nonreactor grade sources, laundry and hot shower drains, spent and excess radioactive samples, and other nonreactor grade sources

- the spent resin collection subsystem transports spent resin to the spent resin storage tank

The waste processing system, gas, removes fission product gases from the RCS in the volume control tank, the boron recycle system, the reactor coolant drain tank, and the liquid waste processing system. The waste processing system, gas, has a long-term storage capacity for fission product gases, eliminating any need for scheduled discharges.

The waste processing system, gas, performs no function for safe shutdown of the plant; however, the system distributes the stored activity inventory so that, in a waste gas decay tank failure, the dose will be a fraction of the 10 CFR Part 100 permissible limit with the curie content of each waste gas decay tank individually limited in accordance with the technical requirements manual; hence, the waste gas decay tanks are safety-related. The tanks and the piping and valves out to the first isolation valve are safety-related, and the safety-related portion includes the common piping header for the discharge of the pressure relief valves for the tanks.

A safety-related interface allows the CLB to consider a waste processing system, gas release and a recycle hold-up tank gaseous release separately. Without the safety-related interface, consideration of the two releases would have to be concurrent; therefore, the interface components mitigate accident consequences and are within the scope of license renewal.

The waste management systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the waste management systems potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the waste management systems perform functions that support EQ.

LRA Table 2.3.3.30 identifies waste management systems component types within the scope of license renewal and subject to an AMR:

- accumulators
- closure bolting

- equipment frames - catalytic H_2 recombiner skid
- equipment frames - waste gas compressor skid
- filter housings
- flow orifice/elements
- gas traps
- piping components
- piping components - pipe spools for startup strainers
- pump casings - gas decay drain pumps
- tanks - backflushable filter crud tanks
- tanks - waste gas decay shutdown tanks
- tanks - waste gas decay tanks
- valve bodies

The intended function of the waste management systems component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.30.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.30 and UFSAR Sections 11.4.2.3.2, 10.4.6, 11.2, and 11.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During its review of the backflushable filter system and the condensate cleanup system, the staff evaluated the system functions described in the LRA and the UFSAR to verify that the applicant has not omitted from the scope of license renewal any component types with intended functions delineated under 10 CFR 54.4(a).

During its review of the waste processing system, liquid and waste processing system, gas, 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.30 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 2.3.3.30-1, dated January 28, 2008, the staff noted drawing 1X4LD111 (H-7) shows pipe section 314-2" as within the scope of license renewal based on criterion 10 CFR 54.4(a)(2) with the license renewal boundary identified by note A2 and the continuation portion not within the scope of license renewal. However, the continuation of pipe 314-2" on 1X4LD127 (A-8) is also identified as within the scope of license renewal. The applicant was asked to provide additional information detailing the license renewal boundary for pipe section 314-2" on drawings 1X4LD111 (H-8) and 1X4LD127 (A-8).

In its response, dated February 27, 2008, the applicant stated:

> A detail review of the piping isometrics that identify the equivalent anchors for the pipe section 314-2" shown on License Renewal drawing 1X4LD111 (H-7) which continues to drawing 1X4LD127 (A-8) confirms that this line should have been shown in scope per criterion 10CFR 54.4(a)(2). This discrepancy represents a duplication in identifying equivalent anchors for this section of pipe. It has been determined that the in-scope pipe section (314-2") per criterion (a)(2) should continue to drawing 1X4LD127 (A-8) and terminate at note 8 downstream.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.30-1 acceptable because the applicant explained that the in scope pipe section (314-2") should continue to drawing 1X4LD127 (A-8) and terminate at note A8. Therefore, the staff's concern described in RAI 2.3.3.30-1 is resolved.

In RAI 2.3.3.30-2, dated January 28, 2008, the staff noted drawings 1X4LD111 (H-3) and 1X4LD127 (F-7) show pipe sections 376-1/2" not within the scope of license renewal. This line connects to 255-3/4" inside the 10 CFR 54.4(a)(2) boundary identified on 1X4LD127. Additionally, 376-1/2" connects to 048-3" valve 025 on drawing 1X4LD111 which is identified within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). The applicant was asked to provide additional information detailing the license renewal boundary for pipe sections 376-1/2" on drawings 1X4LD111 (H-3) and 1X4LD127 (F-7).

In its response, dated February 27, 2008, the applicant stated:

> Mechanical boundary drawing 1X4LD127 should have taken credit for existing pipe supports so that the end point of the in-scope portion of line 1901-199-3/8" terminated before the connection to line 1901-001-3." This removes part of line 1901-199-3/8," all of line 1901-001-3," and all of line 1901-255-3/4" from scope. Refer to the answer to RAI 2.3.3.30-4 for additional discussion of line 1901-376-1/2".

Based on its review, the staff finds the applicant's response to RAI 2.3.3.30-2 acceptable because the applicant stated that:

> Connecting line to 255-3/4" as well as 376-1/2" are not included in scope. These lines are non-safety related and are not in scope for 10 CFR 54.4(a)(1). Also these lines are not in scope for 10 CFR 54.4(a)(2) connected pipe criteria because the CLB considers that the non-safety related small bore line can not affect the large bore safety related line and spatial interaction criteria because all safety related SCs inside containment are assumed to be qualified for spray effects or submergence.

Therefore, the staff's concern described in RAI 2.3.3.30-2 is resolved.

In RAI 2.3.3.30-3, dated January 28, 2008, the staff noted drawing 1X4LD114 (G-3) shows pipe section 369-1/2" within the scope of license renewal based on criterion for 10 CFR 54.4(a)(2). However, the continuation of pipe section 369-1/2" on drawing 1X4LD127 (G-7) shows it is not within the scope of license renewal. The applicant was asked to provide additional information detailing the license renewal boundary for pipe sections 369-1/2" on drawings 1X4LD114 (G-3) and 1X4LD127 (G-7).

In its response, dated February 27, 2008, the applicant stated:

> Mechanical boundary drawing 1X4LD114 inadvertently showed lines 1901-382-1/2" and 1901-369-1/2" as being in scope for 10 CFR 54.4(a)(2). However, these lines are not in scope. Mechanical boundary drawing 1X4LD127 correctly shows line 1901-369-1/2" as not in scope. Refer to the answer to RAI 2.3.3.30-4 for additional discussion.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.30-3 acceptable because the applicant explained that 1901-382-1/2" and 1901-369-1/2" are non-safety related and are not in scope for 10 CFR 54.4(a)(1). Also, these lines are not in scope for 10 CFR 54.4(a)(2) connected pipe criteria because the CLB considers that the non-safety related small bore line can not affect the large bore safety related line and spatial interaction criteria because all safety related SCs inside containment are assumed to be qualified for spray effects or submergence. Therefore, the staff's concern described in RAI 2.3.3.30-3 is resolved.

In RAI 2.3.3.30-4, dated January 28, 2008, the staff noted drawing 1X4LD114, (G-3) and (F-3), shows pipe sections 369-1/2" within the scope of license renewal based on criterion 10 CFR 54.4(a)(2) and 428-1/2" within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). The following pipe sections which also continue to the reactor coolant drain tanks are not within the scope of license renewal:

> 1X4LD114 and 2X4LD114 (F-5) 364-1/2"
> 1X4LD114 and 2X4LD114 (G-5) 363-1/2"
> 1X4LD114 and 2X4LD114 (G-5) 365-1/2"
> 1X4LD114 and 2X4LD114 (F-5) 366-1/2"
> 1X4LD114 and 2X4LD114 (G-6) 362-1/2"
> 1X4LD114 and 2X4LD114 (G-7) 370-1/2"
> 1X4LD114 and 2X4LD114 (G-7) 375-1/2"
> 1X4LD114 (G-8) 370-1/2"
> 1X4LD114 and 2X4LD114 (E-3) 371-1/2"
> 2X4LD114 (F-4) 428-1/2", Note 428-1/2" is in scope for 10 CFR 54.4(a)(1) on 1X4LD114 (F-4).
> 2X4LD114 (G-3) 369-1/2", Note 369-1/2" is in scope for 10 CFR 54.4(a)(2) on 1X4LD114 (G-3).
> 2X4LD114 (G-4) 382-1/2", Note 382-1/2" is in scope for 10 CFR 54.4(a)(2) on 1X4LD114 (G-4).

The applicant was asked to provide additional information detailing the license renewal boundaries for the above pipe sections and explain the apparent difference in scoping methodologies.

In its response, dated February 27, 2008, the applicant stated:

> Mechanical boundary drawing 1X4LD114 inadvertently showed lines 1901-382-1/2" and 1901-369-1/2" as being in scope for

10 CFR 54.4(a)(2). Refer to the answer to RAI 2.3.3.30-3. These lines are not in scope. See below for 10 CFR 54.4(a)(2) criteria discussion.

Mechanical boundary drawing 1X4LD114 inadvertently showed line 1901-428-1/2" as being in scope for 10 CFR 54.4(a)(1). Line 1901-428-1/2" is Project Classification 427, which is non-safety related and therefore not in scope for 10 CFR 54.4(a)(1). See below for 10 CFR 54.4(a)(2) criteria discussion.

Lines 1901-362-1/2," 1901-363-1/2," 1901-364-1/2," 1901-365-1/2," 1901-366-1/2," 1901-369-1/2," 1901-370-1/2," 1901-371-1/2," 1901-375-1/2," 1901-382-1/2," and 1901-428-1/2" on each unit are non-safety related valve packing leakoff lines. Because they are non-safety related they are not in scope for 10 CFR 54.4(a)(1).

These lines are not in scope for 10 CFR 54.4(a)(2) connected pipe criteria because the CLB considers that the non-safety related small bore line can not affect the large bore safety related line. In general the stress calculations consider the loads imposed on a large bore line by ½" or ¾" tubing to be insignificant and those loads are neglected. The small bore line is considered to be decoupled. Therefore the 10 CFR 54.4(a)(2) connected pipe criteria does not apply.

These lines are not in scope for 10 CFR 54.4(a)(2) spatial interaction criteria because all safety related SCs inside containment are assumed to be qualified for spray effects or submergence, where required, to address a high energy line break or LOCA. Furthermore, the pipe supports for these lines are in scope so seismic 2/1 is not a concern and the lines operate at low pressure so pipe whip is not a concern.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.30-4 acceptable because the applicant explained that the subject lines are non-safety related and are not in scope for 10 CFR 54.4(a)(1). Also these lines are not in scope for 10 CFR 54.4(a)(2) connected pipe criteria because the CLB considers that the non-safety related small bore line can not affect the large bore safety related line and spatial interaction criteria because all safety related SCs inside containment are qualified for spray effects or submergence. Therefore, the staff's concern described in RAI 2.3.3.30-4 is resolved.

In RAI 2.3.3.30-5, dated January 28, 2008, the staff noted drawing 2X4LD124 (A-5) shows the license renewal boundary for pipe section 045-2" from the Boron Recycle System (BRS) recycle evaporator as within the scope of license renewal based on criterion 10 CFR 54.4(a)(2). This in-scope line is continued from drawing AX4LD123-1. However, the same section of pipe on Unit 1 is identified as not within the scope of license renewal in drawing 1X4LD124 (A-5). The applicant was asked to provide additional information explaining the apparent difference in scoping methodologies for pipe section 045-2" on drawings 1X4LD124 (A-5) and 2X4LD124 (A-5).

In its response, dated February 27, 2008, the applicant stated:

The scoping methodologies for Unit 1 and Unit 2 piping line number 045-2"

> are the same. A section of Unit 2 piping line number 2-1901-045-2" is located on Level B of the auxiliary building in the vicinity of safety related components that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). The corresponding section of Unit 1 piping (line number 1-1901-045-2") is located in a separate area of the auxiliary building such that there is no potential for spatial interaction with safety related components. Therefore, only the Unit 2 piping section is within the scope of license renewal based on criterion 10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.30-5 acceptable because the applicant explained that a section of Unit 2 piping line number 2-1901-045-2" is located on Level B of the auxiliary building in the vicinity of safety related components that are within the scope of license renewal based on criterion 10 CFR 54.4(a)(1). The corresponding section of Unit 1 piping is located in a separate area of the auxiliary building such that there is no potential for spatial interaction with safety related components. Therefore, the staff's concern described in RAI 2.3.3.30-5 is resolved.

2.3.3.30.3 Conclusion

The staff reviewed the LRA and UFSAR associated with the backflushable filter system and the condensate cleanup system to determine whether the applicant failed to identify component types that are typically found within the scope of license renewal and finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the backflushable filter system and the condensate cleanup system component types within the scope of license renewal, as required by 10 CFR 54.4(a).

The staff reviewed the LRA, UFSAR, RAI responses, and drawings to determine whether the applicant failed to identify any components within the scope of license renewal for the waste processing system, liquid, and the waste processing system, gas. 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 the applicant has adequately identified the waste processing system, liquid, and the waste processing system, gas, 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).

2.3.3.31 Thermal Insulation

2.3.3.31.1 Summary of Technical Information in the Application

LRA Section 2.3.3.31 describes the thermal insulation, which minimizes heat loss from components and protects personnel from high-temperature components. Insulation in areas with safety-related equipment retains structural integrity during and after a seismic Category I event. The insulation support structures for the reactor vessel and nozzles limit the amount of insulation displaced by blowdown during a LOCA condition below the amount assumed for the reactor cavity pressurization analysis. Inside the containment, the containment cooling system design credits insulation on components with high operating temperatures.

Thermal insulation outside containment has no safety design basis; however, insulation in areas with safety-related equipment is designed to retain structural integrity during and after seismic events.

Insulation on piping at containment penetrations must keep local concrete temperatures below 200 °F. For certain HVAC systems, heat load calculations, that assure performance of safety-related functions credit insulation. The EDG building heat-up calculation credits EDG exhaust pipe insulation (including the silencers).

Outside area insulation with heat tracing protects small-bore piping and instrument lines for in-scope systems from freezing. Insulation supports heat tracing and shields lines in the battery rooms from spray.

The failure of nonsafety-related SCs in the thermal insulation could prevent the satisfactory accomplishment of a safety-related function. The thermal insulation also performs functions that support SBO.

LRA Table 2.3.3.31 identifies thermal insulation component types within the scope of license renewal and subject to an AMR:

- insulation - jacketing and supports
- thermal insulation

The intended functions of the thermal insulation component types within the scope of license renewal include:

- environmental control of plant areas within equipment limitations
- physical integrity maintenance to prevent generation of debris or loose parts which could interfere with a safety-related function
- shelter/protection for safety-related/nonsafety-related components
- structural/functional support for safety-related/nonsafety-related components with maintenance of physical integrity and flow path considerations

2.3.3.31.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.31 and UFSAR Sections 5.2.3.2.3 and 6.2.1.2.1.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.31.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the thermal insulation 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).

2.3.3.32 Miscellaneous Leak Detection System

2.3.3.32.1 Summary of Technical Information in the Application

LRA Section 2.3.3.32 describes the miscellaneous leak detection system, which detects leaks in the containment bottom and side liners and in liners of the spent fuel pool, fuel transfer canal, and fuel cask loading pit. This system also has containment penetrations necessary to perform the periodically necessary containment integrated leak rate test.

The miscellaneous leak detection system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the miscellaneous leak detection system potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3.32 identifies miscellaneous leak detection system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping components
- valve bodies

The intended function of the miscellaneous leak detection system component types within the scope of license renewal is to provide a pressure-retaining boundary.

2.3.3.32.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.32 and the UFSAR using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.32.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the miscellaneous leak detection 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 Steam and Power Conversion Systems

LRA Section 2.3.4 identifies the steam and power conversion systems SCs 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	main steam system
2.3.4.2	condensate and feedwater
2.3.4.2	condensate chemical injection
2.3.4.2	feedwater heater and MSR drain
2.3.4.3	steam generator blowdown system
2.3.4.4	auxiliary feedwater systems
2.3.4.5	auxiliary steam system
2.3.4.6	electrohydraulic control system

All of these systems are Balance of Plant systems.

The staff identified the following BOP systems for Tier 1 reviews:

LRA Section	System
2.3.4.2	feedwater heater and moisture separator/reheater drain system
2.3.4.5	auxiliary steam system

2.3.4.1 Main Steam System

2.3.4.1.1 Summary of Technical Information in the Application

LRA Section 2.3.4.1 describes the main steam system (MSS), which is integral to the nuclear steam supply system heat removal systems and steam generator overpressure protection features. The main steam system conducts the steam generated in the four steam generators through the containment to the turbine-generator, moisture separator reheaters, steam jet air ejectors, turbine shaft gland seals, steam generator feedwater pump turbines, turbine-driven auxiliary feedwater pump, and the turbine bypass system.

Safety-related portions of the main steam system include heat removal, overpressure protection, and isolation features. Steam conducted from the steam generators to the atmospheric relief and main steam safety valves, which protect the steam generator and the main steam piping from over-pressurization, removes heat from the RCS. The outlet nozzle of each steam generator has a flow restrictor designed to limit flow rate and thrust loads in a main steam line rupture. The main steam system also supplies steam to the auxiliary feedwater pump turbine supplying feedwater to the steam generators for reactor heat removal during accident or transient conditions when normal feedwater is unavailable.

Each of the four main steam lines has two main steam isolation valves and two main steam bypass valves to isolate the secondary side of the steam generators in the event of leakage or malfunction to prevent uncontrolled blowdown of the steam generators and to isolate nonsafety-related portions of the system.

The main steam system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the MSS potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the main steam system performs functions that support fire protection, ATWS, SBO, and EQ.

LRA Table 2.3.4.1 identifies main steam system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- filter housings - ARV local (manual) actuators
- flexible connectors
- flow orifice/elements
- flow restrictors - ARV discharge paths
- oil reservoirs - ARV local (manual) actuators
- oil reservoirs filler/breather caps - ARV local (manual) actuators
- piping components
- piping components - forged sections for 5-way pipe restraints
- pump casings - ARV manual hand pumps
- pump casings - wet layup recirculation pumps
- valve bodies

The intended functions of the main steam system component types within the scope of license renewal include:

- protection from debris
- spray shield or curbs for flow direction
- restriction of process flow
- pressure-retaining boundary

2.3.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.1 and UFSAR Section 10.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.4.1.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the main steam 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 Feedwater System

2.3.4.2.1 Summary of Technical Information in the Application

LRA Section 2.3.4.2 describes the feedwater system, which includes the following:

- condensate and feedwater system
- condensate chemical injection system
- feedwater heater and moisture separator/reheater drain system

The condensate and feedwater system condenses high-pressure and low-pressure turbine extraction and exhaust steam and main feedwater pump turbine exhaust steam, collects the condensate in the condenser hotwell, and maintains steam generator water levels by supplying preheated feedwater through all power operation modes of the plant. The system also isolates feedwater as required to limit mass and energy in the containment in any feedwater break and prevents RCS over-cooling and steam generator overfilling with water in the steam lines. Feedwater flow to each steam generator is via a 16-inch main feedwater line to the steam generator main feedwater nozzle or the 6-inch feedwater bypass line to the auxiliary feedwater nozzle. The system shares the feedwater bypass line portion from upstream of the feedwater bypass isolation valves to the steam generator bypass feedwater/auxiliary feedwater nozzle with the safety-related auxiliary feedwater (AFW) system.

The primary function of the condensate chemical injection system is to supply chemicals to the condensate and feedwater system for corrosion control. The condensate chemical injection system includes the piping and storage/transfer equipment conveying the chemicals and extending to the piping for the condensate and feedwater system, AFW system, and steam generators. System safety functions are containment isolation and integrity.

The feedwater heater and moisture separator/reheater drain system drains the liquid (condensed steam) from the feedwater heaters and moisture separator/reheaters and routes it to the condensate and feedwater system. This system performs no safety function but is within the 10 CFR 54.4(a)(2) scope of license renewal.

The feedwater system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the feedwater system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the feedwater system performs functions that support ATWS and EQ.

LRA Table 2.3.4.2 identifies feedwater system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- piping components
- piping components - forged sections for 5-way pipe restraints
- piping components - guard pipe
- valve bodies

The intended functions of the feedwater system component types within the scope of license renewal include:

- restriction of process flow
- pressure-retaining boundary

2.3.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.2 and UFSAR Sections 10.3.5 and 10.4.7 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During its review of the condensate and feedwater system and the condensate chemical injection system, 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

During its review of the feedwater heater and moisture separator/reheater drain system, the staff evaluated the system functions described in the LRA and the UFSAR to verify that the applicant has not omitted from the scope of license renewal any component types with intended functions delineated under 10 CFR 54.4(a).

2.3.4.2.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings associated with the condensate and feedwater system and the condensate chemical injection system to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the condensate and feedwater system and the condensate chemical injection 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 staff reviewed the LRA and UFSAR associated with the feedwater heater and moisture separator/reheater drain system to determine whether the applicant failed to identify component types that are typically found within the scope of license renewal and finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the feedwater heater and moisture separator/reheater drain system component types within the scope of license renewal, as required by 10 CFR 54.4(a).

2.3.4.3 Steam Generator Blowdown System

2.3.4.3.1 Summary of Technical Information in the Application

LRA Section 2.3.4.3 describes the steam generator blowdown system, which accepts secondary water from each steam generator blowdown line, processes the water as required, and delivers the processed water to either the condensate system or the waste water retention basin. Process steps include cooling with heat recovery, pressure reduction, filtration, and ion exchange. The purpose of the steam generator blowdown system is to maintain optimum secondary side water chemistry during normal operation and during anticipated operational occurrences by removing impurities from primary coolant or circulating water in-leakage concentrated in the steam generator by evaporation.

Safety-related instrumentation in the steam generator blowdown system helps detect and isolate high-energy lines in the auxiliary building. Interfaces between steam generator blowdown system nonsafety-related portions and other plant systems can affect safety-related portions of the plant adversely following a postulated pipe rupture in the nonsafety-related high-energy portion of the system outside of containment.

The steam generator blowdown system contains safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the steam generator blowdown system potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the steam generator blowdown system performs functions that support EQ.

LRA Table 2.3.4.3 identifies steam generator blowdown system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- filter housings
- flow orifice/elements
- heat exchangers - SGBD HXs (channel heads)
- heat exchangers - SGBD HXs (shells)
- heat exchangers - SGBD trim HXs (channel heads)
- heat exchangers - SGBD trim HXs (shells)
- piping components
- piping components - pipe spools for startup strainers
- pump casings - steam generator drain pumps
- pump casings - steam generator blowdown spent resin sluice pumps
- strainer housings
- valve bodies

The intended functions of the steam generator blowdown system component types within the scope of license renewal include:

- restriction of process flow
- pressure-retaining boundary

2.3.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.3 and UFSAR Section 10.4.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.4.3.3 Conclusion

The staff reviewed the LRA, UFSAR and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the steam generator blowdown 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 Auxiliary Feedwater System (1302)

2.3.4.4.1 Summary of Technical Information in the Application

LRA Section 2.3.4.4 describes the AFW system, which supplies feedwater to the steam generators during startup, cooldown, and emergency conditions resulting in a loss of main feedwater. The two motor-driven and one turbine-driven AFW pumps are available to ensure the required feedwater flow to the steam generators. During normal operations, the system is in a standby mode with controls selected for automatic operation.

System capacity is sufficient to remove decay heat and to supply adequate feedwater for RCS cooldown within specified limits. The AFW system is relied upon for feedwater supply to the steam generators to maintain a secondary heat sink for DBE mitigation; therefore, this system is safety-related.

The AFW feedwater source for both normal conditions and DBE mitigation is the condensate storage tank. Such tanks are constructed of concrete lined with stainless steel. This section evaluated the tank liner as a mechanical component. LRA Section 2.4.7, "Concrete Tank and Valve House Structures," evaluated the concrete shell, roof, and base slab. The condensate storage tanks have floating diaphragms to minimize oxygen absorption.

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

LRA Table 2.3.4.4 identifies AFW system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- filter housings
- flow orifice/elements
- oil coolers - TDAFWP turbine (channel heads)
- oil coolers - TDAFWP turbine (shells)
- oil coolers - TDAFWP turbine (tubes)
- oil coolers - TDAFWP turbine (tubesheets)
- oil reservoirs - TDAFWP turbine lube oil
- piping components
- piping components - pipe spools for startup strainers
- pump casings - AFW pumps
- pump casings - CST vacuum degasifier pumps
- pump casings - TDAFWP lube oil pumps
- spargers - TDAFWP steam exhaust condensate
- tank - CST degasifier tank
- tank diaphragms - CSTs
- tank liners (and internals) - CST liners
- turbine casings (AFW pump drive turbine)
- valve bodies

The intended functions of the AFW system component types within the scope of license renewal include:

- heat exchange between fluid media
- flow pattern or distribution provision
- restriction of process flow
- physical integrity maintenance to prevent generation of debris or loose parts which could interfere with a safety-related function
- pressure-retaining boundary

2.3.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.4 and UFSAR Section 10.4.9 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.4.4 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.

In RAI 2.3.4.4-1, dated January 28, 2008, the staff noted drawings 1X4LD161-1 and 2X4LD161-1 (E-7) downstream of valve HV5089 is shown as within the scope of license renewal based on criterion 10 CFR 54.4(a)(2), up to an equivalent anchor A1/A4, whereas, there is no annotation if there is an equivalent anchor for the 153-10" line at HV5103. The applicant was asked to provide additional information justifying the boundary locations with respect to the applicable requirements of 10 CFR 54.4(a).

In its response, dated February 27, 2008, the applicant stated:

> Downstream of HV5103 on 1X4LD161-1 and 2X4LD161-1 is a spool piece identified as line 1302-104-10." This spool piece is shown as not in scope (colored gray) and in phantom on these boundary drawings because it is a removable spool piece that is only installed for hydrostatic testing of the main condenser. The lines on either side of the spool piece (1302-153-10" and 1302-010-10"") terminate at the blind flanges. The end point of line 1302-153-10" is therefore defined in accordance with the guidance provided in NEI 95-10, Appendix F, as the free end of the non-safety related piping. An equivalent anchor is not required.

By telecom dated April 17, 2008, the applicant corrected an error in line reference numbers from 1302-153-10" and 1302-010-10" to 1305-153-10" and 1305-010-10", respectively.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.4-1 acceptable, because the applicant explained that the lines on either side of the spool piece (1305-153-10" and 1305-010-10") terminate at the blind flanges. The end point of line 1305-153-10" is therefore defined in accordance with the guidance provided in NEI 95-10, Appendix F, as the free end of the non-safety related piping. Therefore, the staff's concern described in RAI 2.3.4.4-1 is resolved.

2.3.4.4.3 Conclusion

The staff reviewed the LRA, UFSAR, RAI response, and drawings to determine whether the applicant failed to identify any components within the scope of license renewal. 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 the applicant has adequately identified the auxiliary feedwater 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).

2.3.4.5 Auxiliary Steam System

2.3.4.5.1 Summary of Technical Information in the Application

LRA Section 2.3.4.5 describes the auxiliary steam system, which conveys auxiliary steam to the balance-of-plant systems during startup, shutdown, and normal operation. The supply of steam for this system is the main steam system. By a cross-connect an operating unit can supply steam to a unit shut down. The auxiliary steam system performs the following functions:

- heating of the condensate during condensate and feedwater system preoperational cleanup
- assisting in attaining and holding the required vacuum in the main condensers
- sealing the glands of the main turbine and feedwater pump drive turbines prior to the availability of main steam
- preoperational testing of the AFW pump turbine and steam generator feedwater pump turbines
- heating the cleaning solutions for preoperational piping and equipment cleaning
- steam blanketing of moisture separator reheaters during plant shutdown
- assisting in deaeration of the main condensate during cold cleanup operations
- as an alternative, main steam line and main turbine shell preheating following extended main steam isolation and prior to entry of steam from steam generators

The failure of nonsafety-related SCs in the auxiliary steam system could potentially prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.4.5 identifies auxiliary steam system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow orifice/elements
- piping components
- steam/fluid trap bodies
- valve bodies

The intended functions of the auxiliary steam system component types within the scope of license renewal include:

- restriction of process flow
- pressure-retaining boundary

2.3.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.5 and UFSAR Section 9.5.9 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 component types with intended functions delineated under 10 CFR 54.4(a).

2.3.4.5.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any component types that are typically found within the scope of license renewal and finds no such omissions. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the auxiliary steam system component types within the scope of license renewal, as required by 10 CFR 54.4(a).

2.3.4.6 Electrohydraulic Control System

2.3.4.6.1 Summary of Technical Information in the Application

LRA Section 2.3.4.6 describes the electrohydraulic control system. The steam turbine converts the thermal energy of the steam from the main steam system into mechanical energy to drive the main generator and produce the plant electrical output. Integral to operation of the turbine is the turbine control system, which includes the digital electrohydraulic control system.

The turbine control system positions the steam valves controlling steam flow to the high-pressure and low-pressure turbines (*i.e.*, high-pressure control valves and stop valves and low-pressure intermediate stop valves and intercept valves). The electrohydraulic control system meets the fluid pressure demands for positioning of these steam valves. The turbine lube oil system supplies pressurized oil to the auto-stop oil header and lubricates the turbine. Loss of the auto-stop oil header pressure or the electrohydraulic control fluid pressure to the actuators will close the steam valves (tripping the turbine).

Electrohydraulic control system nonsafety-related components required to trip the turbine in response to ATWS are within the 10 CFR 54.4(a)(3) regulated event scoping criteria for license renewal. The applicant conservatively includes nonsafety-related components which trip the turbine in response to overspeed within the scope of license renewal under 10 CFR 54.4(a)(2).

The failure of nonsafety-related SCs in the electrohydraulic control system could potentially prevent the satisfactory accomplishment of a safety-related function. The electrohydraulic control system also performs functions that support ATWS.

There are no electrohydraulic control system mechanical components subject to an AMR. The screening process concluded that active components accomplish system mechanical component functions and that any component pressure boundary failure would not prevent performance of system intended functions, a conclusion consistent with the SRP-LR Table 2.1-5 as to turbine controls for actuator and overspeed trip. The screening concluded that the electrohydraulic control system components perform no intended functions for license renewal; therefore, none of the electrohydraulic control system components are subject to an AMR.

2.3.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.6 and UFSAR Sections 7.7.1.11, 10.1, 10.2, and 10.2.2.3.1.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.4.6.3 Conclusion

The staff reviewed the LRA, UFSAR, and drawings to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the electrohydraulic control 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).

2.4 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:

- containment structures
- auxiliary, control, fuel handling, and equipment buildings
- EDG structures
- turbine building
- tunnels and duct banks
- nuclear service cooling water structures
- concrete tank and valve house structures
- switchyard structures
- fire protection structures
- radwaste structures
- auxiliary feedwater pumphouse structures
- component supports and bulk commodities

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant must identify and 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 approach allowed the staff to confirm that there were no omissions of structures and components that meet the scoping criteria and are subject to an AMR.

The staff's evaluation of the information in the LRA was performed in the same manner 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 those 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 SCs 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, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed the UFSAR, for each structure to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the UFSAR to determine whether the LRA specified all intended functions delineated under 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 described in 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 Containment Structures

2.4.1.1 Summary of Technical Information in the Application

In LRA Section 2.4.1, the applicant described the containment structures, including containment buildings and containment internal structures. The containment building is a seismic Category I structure that completely encloses the reactor, the Reactor Coolant System (RCS), the steam generators, and portions of the auxiliary and engineered safety features systems. The containment building also houses components required for reactor refueling, including the polar crane, refueling cavity, and portions of the fuel handling system. The containment structure protects these features from external events (*e.g.*, tornado, flooding, et cetera) and functions as a fission product barrier following an accident. The containment structure also provides biological shielding during normal operation and following a LOCA.

The major elements of the containment building structure are the main structure and foundation, the steel containment liner, and the containment penetrations.

The containment internal structures are comprised of concrete and steel components. The major concrete internal components are the reactor cavity and primary shield wall, secondary shield wall, refueling cavity (and transfer canal), and floor slabs. Major steel internal components are the refueling canal liner and structural steel framing. Miscellaneous items unique to the containment internal structures include the emergency sump screens and the trisodium phosphate baskets on the containment base slab. Common structural commodities include supports for piping, cable trays, conduits, ventilation ducting, and other components, whip restraints, cable trays and conduits, platforms, racks and frames, and grating.

The containment structures contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the containment structure potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the containment structures perform functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.1 identifies containment structures component types within the scope of license renewal and subject to an AMR.

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4, “Scoping and Screening Results: Structural Systems.”

During its review of the LRA Section 2.4.1, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant’s scoping and screening results for containment structures. Therefore, the staff issued requests for additional information (RAI) by letter dated January 28, 2008 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following discussion describes the staff’s RAI related to the LRA Section 2.4.1, the corresponding applicant responses, and the staff evaluation.

In Section 2.4.1 of the LRA the applicant stated that a tendon access gallery is located beneath the perimeter of the base slab for the installation and inspection of the U-shaped tendons. In RAI 2.4.1-1 dated January 28, 2008 the staff asked whether the applicant considered the tendon access gallery and its associated vertical access shafts in the scope of license renewal and subject to an AMR.

By letter dated February 27, 2008, the applicant provided the response to RAI 2.4.1-1 and confirmed that the tendon access gallery and its associated vertical access shafts are included in the scope of license renewal for VEGP and subject to an AMR. Therefore, the staff finds the applicant’s scoping of the tendon access gallery acceptable.

From review of LRA Table 2.4.1, the staff could not determine if the following components of the Containment Structures have been screened-in as components subject to an AMR.

(i) Control rod drive missile shield
(ii) Polar crane support brackets
(iii) Reactor cavity manipulator crane

In RAI 2.4.1-2 dated January 28, 2008, the staff asked the applicant to clarify the inclusion of these components in the scope of license renewal.

By letter dated February 27, 2008, the applicant provided the following response to RAI 2.4.1-2.

(i) Control rod drive missile shield has been screened-in as a component subject to an AMR. This item is included in Table 2.4.1 ID 13 'Steel Components: Integrated Reactor Head Steel Assemblies.'

(ii) Polar crane support brackets have been screened-in as a component subject to an AMR. This item is included in Table 2.4.1 ID 11 'Steel Components: All Structural Steel.'

(iii) Reactor cavity manipulator crane is part of 'Refueling Machine' at VEGP and it has been screened-in as a component subject to an AMR. This item is included in section 2.3.3.3 under 'Fuel Handling and RV Servicing Equipment.'

In its response, the applicant provided clarification that the control rod drive missile shield, polar crane support brackets and reactor cavity manipulator crane are included in the scope of license renewal for VEGP and subject to an AMR. Therefore, the staff finds the applicant's response to RAI 2.4.1-2 acceptable.

Under the title "Steel Containment Liner" in Section 2.4.1, the LRA states that "The floor liner plate is installed on top of the foundation slab and is then covered with concrete". The staff issued RAI 2.4.1-3 on January 28, 2008 to request the applicant to confirm that the inaccessible floor liner plate of the base mat including the leak chase system and the concrete fill slab above this liner are included in the components listed in Table 2.4.1 and are subject to an AMR.

By letter dated February 27, 2008, the applicant provided the response to RAI 2.4.1-3 and confirmed that the inaccessible floor liner plate (including the leak chase system) on the top of the base mat is included in Table 2.4.1 ID 14 'Steel Components: Liner (Containment); Liner Anchors; Integral Attachments' and the concrete fill slab above this liner is included in Table 2.4.1 ID 4 'Concrete: Internal Structures'. Considering that these items are included in the scope of license renewal for VEGP and subject to an AMR, the staff finds the applicant's response to RAI 2.4.1-3 acceptable.

By letter dated January 28, 2008, the staff issued RAI 2.4.1-4 to request the applicant to clarify that the component identified as "Steel Components: All Structural Steel" in various tables in Section 2.4 of the LRA includes the connection components (gusset plates, welds, bolts, etc.) of structural steel.

By letter dated February 27, 200, the applicant confirmed that the connection components (gusset plates, welds, bolts, etc.) are included in the scope of license renewal for VEGP and subject to an AMR. Therefore, the staff finds the applicant's response to RAI 2.4.1-4 acceptable.

By letter dated January 28, 2008, the staff issued RAI 2.4.1-5 to request clarification on the intended function of containment internal structure relative to radiation shielding as described in Section 3.8.3 of the VEGP UFSAR.

By letter dated February 27, 2008, the applicant confirmed that radiation shielding is an intended function of concrete internal structures and was inadvertently omitted from Table 2.4.1. By letter dated March 20, 2008, the applicant amended the LRA to add radiation shielding to Table 2.4.1 and Table 3.5.2-1. Therefore, the staff finds the applicant's response related to the intended function of the internal structures acceptable.

LRA Table 2.4.1 lists the Equipment Hatch and Personnel Airlocks as Containment components subject to an AMR. By letter dated January 28, 2008, the staff issued RAI 2.4.1-6 to request the applicant to confirm that the hatch locks, hinges and closure mechanisms that help prevent loss of sealing/leak-tightness for these listed hatches are included in the scope of license renewal and subject to an AMR.

By letter dated February 27, 2008, the applicant responded to RAI 2.4.1-6 stating that the locks, hinges and closure mechanisms for the containment hatches and locks are active components and are not subject to an AMR. In a subsequent telephone conference as summarized in a letter from D. J. Ashley (NRC) to Southern Nuclear Operating Company dated March 26, 2008, the applicant agreed to update the LRA Table 3.5.1 to delete "active component" discussion of Item 3.5.1-17. By letter dated March 20, 2008, the applicant amended the LRA stating that the locks, hinges and closure mechanisms are subject to an AMR under VEGP 10 CFR 50 Appendix J program along with the host components. Considering the above, the staff finds the applicant's response to RAI 2.4.1-6 acceptable.

By letter dated January 28, 2008 issued RAI 2.4.1-7 to request the applicant to confirm that the channel/angle shrouds that have been used at the liner welded joints (including those at penetrations) are considered in-scope components and subject to an AMR.

By letter dated February 27, 2008, the applicant confirmed that all items welded to the concrete side of the liner or welded to the interior face of the liner are included in the scope of License Renewal for VEGP and subject to an AMR. Therefore, the staff finds the applicant's response to RAI 2.4.1-7 acceptable.

Section 3.8.2.1.4 of VEGP UFSAR discusses the isolation valve encapsulation vessel assemblies. These vessels and their respective supports/anchorages were not specifically listed in Table 2.4.1 as in-scope components and subject to an AMR. By letter dated January 28, 2008, the staff issued RAI 2.4.1-8 to request the applicant to confirm that the isolation valve encapsulation vessel assemblies and their supports/anchorages are screened-in and subject to an AMR.

By letter dated February 27, 2008, the applicant provided clarification and confirmed that the isolation valve encapsulation vessel assemblies are in scope and are included in Table 2.3.2.1 and their supports/anchorages are in scope and are included in Table 2.4.2. Considering that the encapsulation vessel assemblies and their supports are considered in the scope of license renewal for VEGP and subject to an AMR, the staff finds the applicant's response to RAI 2.4.1-8 acceptable.

The insulation and cooling system provided to limit the inside face temperature of primary shield wall and reactor cavity to 150°F are described in Section 3.8.3.4.4 of VEGP UFSAR. By letter dated January 28, 2008, the staff issued RAI 2.4.1-9 to request the applicant to confirm that the insulation and cooling system described in Section 3.8.3.4.4 of VEGP UFSAR have been considered in the scope of license renewal and subject to an AMR.

By letter dated February 27, 2008, the applicant provided clarification and confirmed that the insulation installed on the reactor vessel, reactor coolant system piping, and other components inside the containment building with high operating temperatures is credited for reducing the thermal loading inside the containment building, including thermal loading of the primary shield wall and reactor cavity. The applicant also stated that the cooling systems provided to limit the inside face temperature of primary shield wall and reactor cavity consist of the Containment Building Cavity Cooling System and the Containment Building Reactor Support Cooling System.

By letter dated March 20, 2008, the applicant amended the LRA to update Sections 2.3.3.13 and 2.3.3.31 of the LRA to include clarification relative to the criterion 10 CFR 54.4(a)(2) in-scope function of insulation and cooling system provided to limit the inside face temperature of primary shield wall and reactor cavity to 150°F.

Considering the applicant’s clarifications and the LRA updates, the staff finds the applicant’s response to RAI 2.4.1-9 acceptable.

By letter dated January 28, 2008, the staff issued RAI 2.4.1-10 to determine whether the equipment hatch concrete external shield door is considered in the scope of license renewal and subject to an AMR.

By letter dated February 27, 2008, the applicant provided the response to RAI 2.4.1-10 and stated that the equipment hatch concrete external shield door is in-scope and subject to an AMR. By letter dated March 20, 2008, the applicant amended the LRA to update Table 2.4.1 and Table 3.5.2-1 to add the equipment hatch concrete external shield door as a component subject to an AMR. Therefore, the staff finds the applicant’s response to RAI 2.4.1-10 acceptable.

According to VEGP UFSAR Section 2.4.12.1.3.1, ground water is the primary source of supply for reactor cooling water makeup, normal makeup to the nuclear service cooling towers, and fire protection. By letter dated January 28, 2008, the staff issued RAI 2.4.1-11 to request the applicant to provide justification for the exclusion of makeup water wells from the scope of license renewal.

By letter dated February 27, 2008, the applicant provided response to RAI 2.4.1-11 and stated that the Plant Makeup Well Water System is a non-safety related system that does not perform any safety related functions, nor can failure of this system prevent any safety related system from performing its functions. In addition, the applicant stated: that the non-safety related Plant Makeup Well Water System is not in scope for supporting the Fire Protection System because the 10 CFR 54.4(a)(2) criteria do not apply to non-safety related systems or components which support other non-safety related systems or components. Based on the above, the applicant concluded that the Plant Makeup Well Water System does not perform any functions that meet the criteria of 10 CFR 54.4(a)(1), 10 CFR 54.4(a)(2) or 10 CFR 54.4(a)(3) and is not in the scope of license renewal.

In a subsequent telephone conference as summarized in a letter from D. J. Ashley (NRC) to Southern Nuclear Operating Company, Inc. dated March 26, 2008, further discussion with the applicant provided clarification that although VEGP UFSAR Section 2.4.12.1.3.1 states that the Plant Makeup Well Water System is the primary source of supply for fire protection, the fire water storage tanks are credited source of water for the fire protection system. As discussed in NUREG 1800, Table 2.1-2, for 10 CFR 54.4(a)(3), a second level support system (i.e., Plant Makeup Well Water System) need not be considered in the scope of license renewal. Considering the above, the staff finds the applicant's response to RAI 2.4.1-11 acceptable.

Section 2.4.1 of the LRA discusses Jib cranes inside the containment structures. By letter dated January 28, 2008, the staff issued RAI 2.4.1-12 to request the applicant to confirm that the support anchorages and mechanical components of Jib cranes are in-scope and subject to an AMR.

By letter dated February 27, 2008, the applicant responded to RAI 2.4.1-12 and confirmed that the jib cranes and associated passive components are included in Table 2.4.12 ID 21 'Miscellaneous Cranes including Monorails' and support anchorages are included in Table 2.4.12 ID 35 'Supports for EDGs, HVAC Components, and Misc. Mechanical Equipment: Support Members, Welds, Bolted Connections, Support Anchorages to Building Structure'. Considering that the jib cranes, support anchorages and other passive components of jib cranes inside the containment structures are included in the scope of the LRA and subject to an AMR, the staff finds the applicant's response to RAI 2.4.1-12 acceptable.

2.4.1.3 Conclusion

The staff reviewed the LRA, UFSAR, and RAI responses to determine whether the applicant failed to identify any SCs within the scope of license renewal. As noted in Section 2.4.1.2 of the SE, the staff finds certain lack of clarity, but no gross omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the containment structures SCs 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 Auxiliary, Control, Fuel Handling, and Equipment Buildings

2.4.2.1 Summary of Technical Information in the Application

LRA Section 2.4.2 describes the auxiliary, control, fuel-handling, and equipment buildings, which include the following structures:

- auxiliary building
- control building
- fuel-handling building
- equipment buildings

These adjacent structures form a common complex that adjoins the containment buildings.

The auxiliary building is a seven-story reinforced concrete seismic Category I structure common to both plant units located south of the fuel-handling building and containment structures. Three stories are above grade, four subterranean. There are two penetration areas, one, on the south side of each containment. All auxiliary building columns, slabs, and structural walls are of reinforced concrete. The roof is a reinforced concrete slab with a minimum thickness of two feet. The auxiliary building structure is founded on a mat continuous over the plan of the building. The auxiliary building houses major safety-related and nonsafety-related plant facilities (*e.g.*, CVCS, ECCS, RHR system, HVAC facilities) and other equipment.

A number of access openings are sealed with removable concrete block wall units of short height for radiation shielding and maintenance purposes held in place by structural elements (*e.g.*, steel angle or steel beams).

The control building is a six-story, deeply-embedded, reinforced concrete structure common to both plant units situated north of and adjacent to the fuel-handling and the two containment buildings. It is supported on a mat foundation 40 feet below grade. The boxlike center section has three upper levels extending to 60 feet above grade. A partial fourth level extends an additional 20 feet. Penetration areas east and west of the center section for access to the two containment buildings are the primary areas for routing of electrical and control system cables into the containment. Directly north of each containment building is a main steam isolation valve room which extends 40 feet above grade. The control room and technical support center principally occupy the level at grade. The levels immediately above and below grade house the cable spreading rooms. The lowest level houses switchgear and HVAC equipment. The third and fourth floors mainly contain HVAC equipment, while the fourth floor is primarily occupied by nonsafety-related components.

The fuel-handling building is a five-story, boxlike, reinforced concrete structure common to both plant units completely surrounded by other Category I buildings and located between the two containment structures. The fuel storage facility part of the fuel-handling building consists of the new fuel storage area, spent fuel pool (including the structure, liner, and fuel storage racks), fuel transfer canal, cask storage area, cask washdown area, and rooms for supporting equipment.

Each nuclear unit has a separate but connected spent fuel pool approximately 41 feet deep, constructed of reinforced concrete, and lined with stainless steel plate. The spent fuel pool is for underwater storage of spent fuel assemblies after their removal from the reactor. New fuel may be moved from the new fuel racks to the spent fuel racks in preparation for a refueling outage.

The fuel transfer canal is an intermediate handling area connected to the refueling canal inside containment by the fuel transfer tube, which is evaluated as part of the containment structures. The fuel transfer canal may be drained for fuel handling equipment service or flooded for fuel handling. The cask storage area is a location for shipping casks to be loaded. The isolated cask wash area is for cleaning and decontamination of shipping casks. Adjacent rooms house spent fuel cooling and cleanup system equipment that cools and purifies the spent fuel pool water. The fuel-handling building's overhead and refueling load handling cranes are evaluated in Section 2.3.3.3.

The equipment building is not a distinct structure but composed of portions of the control and fuel-handling buildings. The equipment building partially surrounding (approximately three quadrants) the containment building is a seismic Category II structure, designed, however, to seismic Category I requirements to preclude any safety impact on the safety-related equipment in the control and fuel-handling buildings. The primary function of the equipment building is to support nonsafety-related HVAC equipment.

The auxiliary, control, fuel-handling, and equipment buildings contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the auxiliary, control, fuel-handling, and equipment buildings potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the auxiliary, control, fuel-handling, and equipment buildings perform functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.2 identifies auxiliary, control, fuel-handling, and equipment buildings component types within the scope of license renewal and subject to an AMR.

2.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review of the LRA Section 2.4.2, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for auxiliary, control, fuel-handling and equipment buildings. Therefore, the staff issued RAI by letter dated January 28, 2008, to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following discussion describes the staff's RAI related to the LRA Section 2.4.2 and the corresponding applicant responses.

By letter dated January 28, 2008, the staff issued RAI 2.4.2-1 to confirm that the leak chase system for the spent fuel pool liner is in-scope and subject to an AMR.

By letter dated February 27, 2008, the applicant provided response to RAI 2.4.2-1 and confirmed that the leak chase system for the spent fuel pool liner is in the scope of license renewal for VEGP and subject to an AMR. Therefore, the staff finds the applicant's response to RAI 2.4.2-1 acceptable.

2.4.2.3 Conclusion

The staff reviewed the LRA, UFSAR and RAI response to determine whether the applicant failed to identify any SCs within the scope of license renewal. As noted in Section 2.4.2.2 of the SE, the staff finds an item not explicitly identified but no gross omissions were identified. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the auxiliary, control, fuel handling, and equipment buildings SCs 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 Emergency Diesel Generator Structures

2.4.3.1 Summary of Technical Information in the Application

LRA Section 2.4.3 describes the EDG structures, which include the diesel generator buildings and diesel fuel storage tank pump houses. Each diesel generator building and its proximate diesel fuel storage tank pump houses support EDG operation.

The diesel generator buildings (one for each unit) are rectangular, reinforced concrete, seismic Category I structures designed to withstand various combinations of loads defined in the UFSAR. Each bay houses a diesel generator and air-handling, exhaust, and silencing equipment. The building's primary function is to house the diesel generators needed to supply emergency onsite power in a loss of offsite power.

The diesel fuel storage tank pump houses (two for each unit) are seismic Category I structures that shelter the pumps and valves for the buried diesel fuel oil storage tanks supplying the EDGs and house the nozzles, gages, drains, and pump mount systems. The reinforced concrete pump houses straddle the tanks and extend three feet above grade except for a common entry between each pair of pump houses extending 14 feet above grade. Each pump house foundation consists of wall strip footings. The pump houses are boxlike with work space levels above the top of the tanks.

The EDG structures contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the EDG structures potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the EDG structures perform functions that support fire protection and SBO.

LRA Table 2.4.3 identifies EDG structures component types within the scope of license renewal and subject to an AMR.

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.3.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the EDG structures SCs 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 Turbine Building

2.4.4.1 Summary of Technical Information in the Application

LRA Section 2.4.4 describes the turbine building, a nonsafety-related, seismic Category II structure that houses all main turbine-generator equipment including the main condenser and other power-generation and auxiliary equipment.

Steel-framed and enclosed with a reinforced concrete roof and metal siding, the turbine building is a trussed rigid-frame structure above the turbine deck level; below, the frames are braced to reduce side sway. The building has three floors of reinforced concrete or steel grating and a basement. The building mat foundation also supports the turbine pedestal.

The turbine-generator pedestal supports the turbine-generator unit. The pedestal, designed to withstand operating and emergency loading forces including seismic disturbances and machine imbalance, consists of a reinforced concrete deck on columns attached to a basemat. Also part of the turbine building is the elevated electrical bridge structure between the main structure and the control building.

The turbine building and the electrical bridge structure are in close proximity to safety related structures. In addition, the failure of nonsafety-related SCs in the turbine building could potentially prevent the satisfactory accomplishment of a safety-related function. The turbine building also performs functions that support ATWS and SBO.

LRA Table 2.4.4 identifies turbine building component types within the scope of license renewal and subject to an AMR.

2.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.4.4 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review of the LRA Section 2.4.4, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for the turbine building. Therefore, the staff issued RAI by letter dated January 28, 2008, to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following discussion describes the staff's RAI related to the LRA Section 2.4.4 and the corresponding applicant responses.

By letter dated January 28, 2008, the staff issued RAI 2.4.4-1 to request the applicant to provide justification for excluding the turbine pedestal from the scope of license renewal. In addition, considering the plant's current licensing basis, the applicant was requested to discuss the ATWS and SBO systems/components identified in Section 2.4.4 and their spatial interaction with the turbine pedestal.

By letter dated February 27, 2008, the applicant provided the following response to RAI 2.4.4-1.

An integral foundation system is provided for both turbine building and turbine pedestal. The turbine generator pedestal is isolated from the turbine building structure above the foundation. The Turbine building is in scope because of its proximity to class I structures. Cascading effect of turbine pedestal on the main turbine building is not required to be considered. So, turbine pedestal is not in the scope of license renewal. However, turbine pedestal is in scope under maintenance rule and inspected under Structural Monitoring Program.

Some of the raceways and supports for the turbine impulse input signal to the AMSAC system and the output signal to the turbine trip solenoids that are mounted to the turbine pedestal are in the license renewal scope. As per NUREG-1800 for 10 CFR 54.4(a)(3), an applicant need not consider second level support systems. This condition does not need the turbine pedestal to be included in scope of license renewal because as per NUREG-1800 for 10 CFR 54.4(a)(3), an applicant need not consider second level support systems.

Considering that, under the current VEGP licensing basis, the interaction between the turbine pedestal and turbine building is not required to be evaluated, the turbine pedestal is currently inspected under Structural Monitoring Program, and as discussed in NUREG 1800, Table 2.1-2, for 10 CFR 54.4(a)(3), a second level support system (i.e., turbine pedestal) need not be considered in the scope of license renewal, the staff finds the applicant's response to RAI 2.4.4-1 acceptable.

In RAI 2.4.4-2, dated January 28, 2008, the staff asked the applicant to provide justification for excluding the turbine building bridge crane from the scope of license renewal.

By letter dated February 27, 2008, the applicant provided the response to RAI 2.4.4-2 and stated that the turbine building bridge crane is in a seismic Category II structure and does not have any license renewal intended function. The applicant also referred to the response to RAI 2.1-2. In RAI 2.1-2, the staff requested that the applicant provide the rational and basis for not including nonsafety-related SCs in the vicinity of safety related SCs in the turbine building within the scope of license renewal. In response to RAI 2.1-2, the applicant provided justification that while VEGP conservatively classified a number of components in the turbine building as safety related, these components are either strictly anticipatory, perform no safety function, or are not credited in the accident analysis. As such, the provisions of 10 CFR 54.4(a)(2) do not apply and no other components in the turbine building are considered in the scope of license renewal.

Since the components in the turbine building are either anticipatory, perform no safety function and are not credited in the accident analysis, the staff finds the exclusion of turbine building bridge crane from the scope of license renewal acceptable.

2.4.4.3 Conclusion

The staff reviewed the LRA, UFSAR, and RAI responses to determine whether the applicant failed to identify any SCs within the scope of license renewal. As noted in Section 2.4.4.2 of the SE, the staff requested clarification of several items but found no gross omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the turbine building SCs 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 Tunnels and Duct Banks

2.4.5.1 Summary of Technical Information in the Application

LRA Section 2.4.5 describes the tunnels and duct banks, which include mechanical piping tunnels, electrical cable tunnels, duct banks, and valve and pull boxes. The radwaste transfer tunnel is evaluated not in this structures grouping but as part of the radwaste structures in Section 2.4.10 of the LRA.

The Category I tunnels within the scope of license renewal consist of main steam, NSCW, diesel generator piping, diesel generator electric, AFW, turbine electric, and electric steam boiler tunnels. The main steam and electric steam boiler tunnels are designed to seismic Category I criteria and for pipe break loads due to their proximity to and required interface with other seismic Category I structures; however, the design did not have to consider the effects of tornado missiles.

The Category I box-like, reinforced concrete tunnels are buried either completely or with roofs exposed at or near grade level and house piping and electrical trays. The main steam tunnel roof is mainly grating instead of concrete for venting in the event of postulated pipe breaks. The auxiliary feedwater tunnels are covered with removable concrete slabs bolted down to prevent them from becoming missiles in a postulated AFW line break. The underground electrical duct banks for safety-related electrical cables to and from safety-related buildings and equipment are rectangular reinforced concrete structures poured in place around PVC conduit. Also included are nonsafety-related duct runs for SBO (*e.g.*, for the high-voltage switchyard).

Rectangular reinforced concrete valve boxes and pull boxes with steel or aluminum covers for safety-related and aluminum covers for nonsafety-related boxes are located strategically for above-ground access to isolation valves and to cables in buried piping and cable runs routed through the pull boxes to appropriate duct banks.

The tunnels and duct banks contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the tunnels and duct banks potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the tunnels and duct banks perform functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.5 identifies tunnels and duct banks component types within the scope of license renewal and subject to an AMR.

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.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.5.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the tunnels and duct banks SCs 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 Nuclear Service Cooling Water Structures

2.4.6.1 Summary of Technical Information in the Application

LRA Section 2.4.6 describes the NSCW structures, which include the NSCW cooling towers and NSCW valve houses and consist of four NSCW cooling towers (two per reactor unit) and their valve houses. The NSCW structures are seismic Category I safety-related structures designed to withstand the load combinations defined in the UFSAR. The NSCW towers and valve houses support and protect the appropriate NSCW system components during normal plant operation and shutdown conditions as well as during earthquakes, extreme wind, tornadoes, and other abnormal conditions of postulated accidents. The NSCW towers are relied upon as the ultimate heat sink to support normal operation, safe shutdown, and post-accident heat loads.

Each NSCW cooling tower comprised of a cooling tower superstructure and a below-grade storage basin is a reinforced concrete cylindrical shell with a concrete basemat, flat roof deck and supported on a 9-foot thick circular mat foundation.

The NSCW valve house next to each NSCW tower is a transition structure which protects the piping, valves, and electrical supply running from the NSCW tunnels into the tower. The valve houses are irregularly-shaped reinforced concrete structures with roofs approximately 14 feet above and basemat tops approximately 14 feet below grade to match the NSCW tunnels. The NSCW valve house is supported on a 6-foot thick mat foundation.

The NSCW structures contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the NSCW structures potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the NSCW structures perform functions that support fire protection.

LRA Table 2.4.6 identifies NSCW structures component types within the scope of license renewal and subject to an AMR.

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.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.6.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the NSCW structures SCs 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).

2.4.7 Concrete Tank And Valve House Structures

2.4.7.1 Summary of Technical Information in the Application

LRA Section 2.4.7 describes the concrete tank and valve house structures, which include the condensate storage tanks and valve houses, reactor makeup water storage tanks, and RWST. Each unit has two dedicated condensate storage tanks, one reactor makeup water storage tank, and one RWST.

The condensate storage tank is a seismic Category I, safety-related, 480,000-gallon capacity, cylindrical, reinforced concrete shell. Each pair of condensate water storage tanks has a common reinforced concrete valve house protecting piping and equipment from missiles and supported by a combined foundation mat. Perimeter dikes for retention of spilled water are constructed of reinforced concrete integral to the basemat. The condensate storage tank supplies condensate water for the AFW system and for normal make-up and supply to the condenser hot well.

The reactor make-up water storage tank is a seismic Category I, safety-related, 165,000-gallon capacity, cylindrical, reinforced concrete shell supported by a basemat foundation at grade. Tank perimeter dikes for retention of spilled water are constructed of reinforced concrete integral to the basemat. The reactor make-up water storage tank supplies RCS makeup water.

The RWST is a seismic Category I, safety-related, 715,500-gallon capacity, cylindrical, reinforced concrete shell supported by a basemat foundation at grade. Perimeter dikes for retention of spilled water constructed of reinforced concrete are integral portions of the basemat.

The RWST is designed to hold enough dilute boric acid solution to fill the refueling canal prior to refueling operations and to provide injection water to support emergency core cooling and containment spray functions.

The concrete tank and valve house structures contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the concrete tank and valve house structures potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the concrete tank and valve house structures perform functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.7 identifies concrete tanks and valve house structures component types within the scope of license renewal and subject to an AMR.

2.4.7.2 Staff Evaluation

The staff reviewed LRA Section 2.4.7 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.7.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the concrete tank and valve house structures SCs 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).

2.4.8 Switchyard Structures

2.4.8.1 Summary of Technical Information in the Application

LRA Section 2.4.8 describes the switchyard structures, which include the high-voltage and the low-voltage switchyards. The high-voltage switchyard is the connection point for the off-site transmission and generator output lines and for the feeds to the unit startup transformers. The high-voltage switchyard electrical installation connects two preferred power sources from the offsite transmission lines to the transformer yards as required per 10 CFR Part 50 Appendix A General Design Criterion 17. The high-voltage switchyard structures include a switch house with the primary functions of relieving space congestion in the main control room and locating the switchyard relay panels close to their equipment. The switch house also stores other switchyard equipment.

The low-voltage switchyard adjacent to the turbine building is where the main power, unit startup, and unit auxiliary transformers are located. The low-voltage switchyard electrical installation connects the high-voltage switchyard to the plant. The high- and low-voltage switchyards are connected by both overhead and underground cables.

The switchyard structures perform functions that support SBO.

LRA Table 2.4.8 identifies switchyard structures component types within the scope of license renewal and subject to an AMR.

2.4.8.2 Staff Evaluation

The staff reviewed LRA Section 2.4.8 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.8.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the switchyard structures SCs 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).

2.4.9 Fire Protection Structures

2.4.9.1 Summary of Technical Information in the Application

LRA Section 2.4.9 describes the fire protection structures, which include the fire water pumphouse and the structural support feature of the fire water storage tanks.

The primary function of the fire pumphouse is to house conventional fire protection water pumps for extinguishing fires. The fire water pumphouse provide structural support, fire barrier separation, and environmental protection for the fire pumps and their auxiliary components. Only the fire protection features, including fire-rated block walls, equipment pedestals, and the concrete building foundation are within the scope of license renewal.

There are two fire water pumphouse, No. 1 with one electric motor-driven fire pump and one electric motor-driven jockey pump and No. 2 with two diesel-driven fire pumps and one electric motor-driven jockey pump. The floor slab, perimeter footing, and equipment block pads consist of a reinforced concrete mat slab. The one-story concrete masonry buildings have steel-framed concrete roofs supported by steel decking.

The fire water storage tank foundations support two separate fire water storage tanks. The boundary includes a reinforced concrete ring beam and a mat of oiled sand inside the ring beam and underneath the bottom of the tanks. Two 300,000-gallon fire water storage tanks are adjacent to the fire water pumphouse. The fire protection tanks are vertically cylindrical, flat-bottom tanks made of steel plate.

The failure of nonsafety-related SCs in the fire protection structures could potentially prevent the satisfactory accomplishment of a safety-related function. The fire protection structures also perform functions that support fire protection.

LRA Table 2.4.9 identifies fire protection structures component types within the scope of license renewal and subject to an AMR.

2.4.9.2 Staff Evaluation

The staff reviewed LRA Section 2.4.9 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review of the LRA Section 2.4.9, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for fire protection structures. Therefore, the staff issued RAI by letter dated January 28, 2008 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1).

The following discussion describes the staff's RAI related to the LRA Section 2.4.9 and the corresponding applicant responses.

By letter dated January 28, 2008 the staff issued RAI 2.4.9-1 to request the applicant to provide information relative to proximity (spatial interaction) of the demineralized water storage tank and the electrical fire pump house number 1 considering the current VEGP licensing basis.

By letter dated February 27, 2008, the applicant provided response to RAI 2.4.9-1 and stated that the Fire Protection System components contained in electrical fire pump house number 1, including the pump house structure, are non-safety related components that are in scope for license renewal for 10 CFR 54.4(a)(3) criteria. The non-safety related Demineralized Water Storage Tank is not in scope for 10 CFR 54.4(a)(2) spatial interaction criteria relative to electrical fire pump house number 1 because those criteria do not apply to non-safety related systems or components which could affect other nonsafety related systems or components.

In its response, the applicant provided clarification and confirmed that within the current VEGP licensing basis the spatial interaction between nonsafety related SCs which could affect other nonsafety related SCs need not be considered. Therefore, the staff finds the applicant's response to RAI 2.4.9-1 acceptable.

2.4.9.3 Conclusion

The staff reviewed the LRA, UFSAR, and RAI response to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the fire protection structures SCs 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).

2.4.10 Radwaste Structures

2.4.10.1 Summary of Technical Information in the Application

LRA Section 2.4.10 describes the radwaste structures, which house equipment and provide space for processing, packaging, and storage of radioactive wastes generated in normal plant operation. The radwaste structures in the scope of license renewal include the following:

- radwaste transfer tunnel
- radwaste transfer building
- dry active waste warehouse
- dry active waste processing facility
- radwaste processing facility
- alternate radwaste building

The DAW buildings consist of processing and storage buildings located in the southwest portion of the owner-controlled area. These metal-siding buildings, supported on base slabs, have precast concrete panels and concrete masonry walls for shielding. The roofs are metal panels supported by steel beams. The processing building houses equipment for processing dry waste and the storage building stores it for offsite shipment. The grade elevation is above that required for natural flood protection. Curbs and ramps in radioactive areas are provided to contain water from fire sprinkler actuation.

The radwaste processing facility located between the solidification and the field support buildings, a concrete building supported on a slab to house process equipment for handling radioactive liquids, resins, and filters, has a subterranean demineralizer vault, subterranean high-integrity container storage vaults, a rollup door for a truck bay, and a 40-ton bridge crane to service equipment. The slab and shield walls inside the building are designed to retain radioactive liquids.

The alternate radwaste building and its systems and equipment were designed to process liquid and solid waste without utilizing the solidification systems and evaporators of the original plant design. This metal-siding building, which formerly housed the liquid radwaste systems, is supported on a base slab. The building basemat has curbing to retain radioactive liquid. It contains a demineralizer vault, high-integrity container system storage vault, laydown area, and a truck-trailer loading bay. Allotted areas are for staging process shields and process skids.

The radwaste transfer building has two-stories with the basemat located at grade. This building and the radwaste transfer tunnel are no longer in service and abandoned in place; however, the radwaste transfer building has a fire damper on the fire-rated west wall credited with preventing smoke and fire from entering the auxiliary building through the radwaste transfer tunnel, and other fire protection equipment with its supports is also in this building.

The reinforced-concrete radwaste transfer tunnel connects the auxiliary, radwaste transfer, and radwaste solidification buildings and houses pipes for transferring liquid and slurry wastes to the radwaste solidification building (which is abandoned in place), pipes for related services, and a walkway for access. Though the radwaste transfer tunnel is abandoned in place, a portion of it is within the scope of license renewal because of the fire protection and electrical components for fire protection that pass through it. Conservatively, the tunnel from auxiliary building to the entrance of the radwaste transfer building (concrete structure and fire protection supports) and south end of the tunnel (support for in-scope electrical commodities only) are within the scope of license renewal.

The radwaste structures perform functions that support fire protection.

LRA Table 2.4.10 identifies radwaste structures component types within the scope of license renewal and subject to an AMR.

2.4.10.2 Staff Evaluation

The staff reviewed LRA Section 2.4.10 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.10.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the radwaste structures SCs 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).

2.4.11 Auxiliary Feedwater Pumphouse Structures

2.4.11.1 Summary of Technical Information in the Application

LRA Section 2.4.11 describes the AFW pumphouse structures, including the AFW pumps and auxiliary support systems. The AFW pumphouse is a seismic Category I, safety-related structure.

The one-story, rectangular, reinforced concrete AFW pumphouses (one for each unit) extend 22 feet above grade and are supported on basemat foundations four feet below grade. Four interior walls separate the steam- and electric-driven pumps. Roof hatches allow pump access. Separation walls between pumps and tanks guard against fire, flooding, and heat.

The AFW pumphouse structures contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the AFW pumphouse structures potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the AFW pumphouse structures perform functions that support fire protection, ATWS, and SBO.

LRA Table 2.4.11 identifies AFW pumphouse structures component types within the scope of license renewal and subject to an AMR.

2.4.11.2 Staff Evaluation

The staff reviewed LRA Section 2.4.11 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, 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 SCs with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those SCs 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 SCs subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.4.11.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the auxiliary feedwater pumphouse structures SCs 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).

2.4.12 Component Supports and Bulk Commodities

2.4.12.1 Summary of Technical Information in the Application

LRA Section 2.4.12 describes the component supports and bulk commodities, which include the following:

- electrical raceway supports
- HVAC duct supports
- pipe supports
- pipe whip restraints
- raceway system
- miscellaneous cranes and hoists

There are physical interfaces with the structure, system, or component supported and with the building structural element anchoring the support. A primary function of a support is to provide anchorage for DBEs so the supported element can perform its intended function. Items within the scope of license renewal include support members, welds, bolted connections, anchorage (including base plate and grout) to the building structure, spring hangers, guides, and building concrete at bolt/anchorage locations.

The major RCS component group includes the supports and support anchorage for ASME Code class piping and components like pumps and heat exchangers. Components evaluated in this group include support structural members (*e.g.*, welds, bolting) that comprise the interface between the structure and the mechanical component. The reactor pressure vessel is supported by four seats under two hot leg and two cold leg nozzles spaced approximately 90 º apart in the primary shield wall. The support seats carry the vertical loads to the embedded steel welds under each support, while the embedded steel welds in the primary shield wall carry the radial and tangential loads.

Four steel columns vertically support the steam generator. Bearing blocks and a steel beam spanning the inside of the walls supply a lower lateral component support. The upper lateral component support consists of a bearing ring located near the steam generator center of gravity.

Each reactor coolant pump support consists of three structural steel columns and lateral tie rods. A steel ring bearing plate bolted to the flange of the pressurizer support skirt supports the pressurizer. This ring rests in turn on a structural steel frame attached to steel embeds in the pressurizer compartment walls. Four stops projecting from embeds within the pressurizer compartment walls also support the pressurizer laterally at an upper level.

For supports and support anchorage for cable trays, conduits, HVAC ducts, tube track, and instrument tubing components evaluated include cable trays, conduits, HVAC ducts, and their structural support members, welds, bolting, et cetera, comprising the interface between the structure and the mechanical, electrical, or instrument component.

For supports and support anchorage for enclosures of various types that contain and support electrical equipment components evaluated include support structural members, welds, bolting, et cetera, comprising the interface between the structure and the electrical or instrument component.

For supports and support anchorage for equipment not addressed in previous groups (*e.g.*, diesel generators, HVAC fans), components evaluated include support structural members, welds, bolting, et cetera, comprising the interface between the structure and the component.

For structure and anchorage for miscellaneous support structures (*e.g.*, platforms, pipe whip restraints, and high energy line break barriers) not included in the other support categories, component types include support structural members, welds, bolting, et cetera, comprising the support structure and its anchorage.

The component supports and bulk commodities contain safety-related components that relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the component supports and bulk commodities potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the component supports and bulk commodities perform functions that support fire protection, SBO, and EQ.

LRA Table 2.4.12 identifies component supports and bulk commodities within the scope of license renewal and subject to an AMR.

2.4.12.2 Staff Evaluation

The staff reviewed LRA Section 2.4.12 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review of the LRA Section 2.4.12, the staff identified areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results for component supports and bulk commodities. Therefore, the staff issued RAI by letter dated January 28, 2008 to determine whether the applicant properly applied the scoping criteria of 10 CFR 54.4(a) and the screening criteria of 10 CFR 54.21(a)(1). The following discussion describes the staff's RAIs related to the LRA Section 2.4.12 and the corresponding applicant responses.

By letter dated January 28, 2008, RAI 2.4.12-1 was issued to request the applicant to confirm whether the following items are considered in the scope of license renewal:

- Grout pads for building structural column base plates
- Vibration isolators
- Floor and wall embedded plates/anchorages for RCS primary equipment
- Fluid containment curbs/walls/dikes
- Waterproofing membrane in general

- Any other hoists or lifting devices (e.g. Reactor Vessel Head Lifting Device, Reactor Internals Lifting Device)

- Relevant subcomponents of crane (bridge, trolley, rails/hardware, girders)

- All cranes within in-scope structures

By letter dated February 27, 2008, the applicant responded to RAI 2.4.12-1 and stated that grout pads for building structural column base plates, floor and wall embedded plates/anchorages for RCS primary equipment, fluid containment curbs/walls/dikes, waterproofing membrane, relevant crane sub-components (including bridge and trolley, crane rail, fasteners and rail hardware, girders, etc.), and all the cranes within in-scope structures unless otherwise stated as not in scope (e.g., Turbine Building Overhead crane) are included in the scope of license renewal. The applicant also stated that lifting devices are considered tools and rigging components and are not in the scope of license renewal. Furthermore, the applicant stated that vibration isolators are not applicable to VEGP and in a subsequent telephone conference as summarized in a letter from D. J. Ashley (NRC) to Southern Nuclear Operating Company, Inc. dated March 26, 2008, the applicant agreed to update the LRA Section 2.4.12 to remove “vibration isolators” and to clarify that VEGP does not utilize vibration isolators. The applicant, in the same telephone conference, also agreed to update the LRA Table 2.4.12 and Table 3.5.2-12 to change “roof membrane” to “waterproofing membrane.” By letter dated March 20, 2008, the applicant amended the LRA to include the above changes.

Considering the above, the staff finds the applicant’s response to RAI 2.4.12-1 acceptable.

2.4.12.3 Conclusion

The staff reviewed the LRA, UFSAR, and RAI response to determine whether the applicant failed to identify any SCs within the scope of license renewal. As noted in Section 2.4.12.2 of the SE, the staff requested clarification of several items but found no gross omissions. In addition, the staff’s review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that the applicant has adequately identified the component supports and bulk commodities SCs 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 Controls Systems

This section documents the staff’s review of the applicant’s scoping and screening results for electrical and instrumentation and controls (I&C) systems. Specifically, this section discusses:

- scoping - plant-wide electrical

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 electrical and I&C 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 electrical and I&C systems. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components and supporting structures for electrical and I&C 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, 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 electrical and I&C system to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions delineated under 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 described in 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.

2.5.1 Summary of Technical Information in the Application

LRA Section 2.5 describes the scoping - plant-wide electrical, the LRA designation grouping electrical components into one system for scoping, screening, and AMR. This designation is not a VEGP system, not found in the UFSAR, and strictly for convenience in presenting the results of electrical AMRs. LRA Section 2.1.3.3 describes the methodology for identifying electrical and I&C components requiring an AMR. Identification of component types of electrical and I&C systems, mechanical systems, and civil structures within the scope of license renewal was generic. In limited cases (*e.g.*, restoration of offsite power following SBO) component type identification and evaluation was not generic but limited to only the system portion within the scope of license renewal. LRA Section 2.1.2.3.5 describes the evaluation boundaries of the offsite power system for SBO.

During the scoping phase, the applicant determined that the following component types do not meet 10 CFR 54.4(a) criteria:

Metal Enclosed Bus: A metal enclosed bus evaluation determined that VEGP has no metal enclosed bus that supports any license renewal intended function.

Uninsulated Ground Conductors: Nonsafety-related uninsulated ground conductors bond metal raceways, building structural steel, and plant equipment to earth ground through an installed grounding grid and protect personnel and equipment. In the event of a fault in an electrical circuit or component, the ground conductors provide a direct path to ground for fault currents to minimize equipment damage. They do not prevent faults and are not required for equipment operation. Failure of a ground conductor cannot affect any safety functions; therefore, uninsulated ground conductors perform no intended function that meets 10 CFR 54.4(a) criteria and are not within the scope of license renewal.

The in-scope electrical and I&C component types associated with the in-scope electrical and I&C systems contain safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SCs in the scoping - plant-wide electrical potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the electrical component types perform functions that support fire protection, ATWS, SBO, and EQ.

LRA Table 2.5.1 identifies electrical component types within the scope of license renewal and subject to an AMR:

- cable connections (metallic parts) not subject to 10 CFR 50.49 EQ requirements
- conductor insulation for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
- conductor insulation for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements
- connector contacts for electrical connectors exposed to borated water leakage not subject to 10 CFR 50.49 EQ requirements
- fuse holders (not parts of any larger assembly): insulation not subject to 10 CFR 50.49 EQ requirements
- fuse holders (not parts of any larger assembly): metallic clamps
- high-voltage insulators
- switchyard bus and connections
- transmission conductors and connections

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

- insulation resistance to preclude shorts/grounds and unacceptable current leakage
- electrical conductor insulation from ground and support from the mounting structure
- electrical connections for delivery of voltage, current, or signals to specific electric circuit sections

2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.5 using the evaluation methodology described in the guidance in SRP-LR Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and Controls Systems."

During 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 delineated under 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 in accordance with the requirements of 10 CFR 54.21(a)(1).

Interim Staff Guidance (ISG)-2, dated April 1, 2002, "Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout Rule (10 CFR 50.63) for License Renewal (10 CFR 54.4(a)(3))," and later incorporated in SRP-LR Section 2.5.2.1.1 states:

For purposes of the license renewal rule, the staff has determined that the plant system portion of the offsite power system that is used to connect the plant to the offsite power source should be included within the scope of the rule. This path typically includes switchyard circuit breakers that connect to the offsite system power transformers (startup transformers), the transformers themselves, the intervening overhead or underground circuits between circuit breaker and transformer and transformer and onsite electrical system, and the associated control circuits and structures. Ensuring that the appropriate offsite power system long-lived passive structures and components that are part of this circuit path are subject to an AMR will assure that the bases underlying the SBO requirements are maintained over the period of extended license.

Section 2.1.2.3.5 of the LRA indicates that the preferred path of offsite power when recovering from a Station Blackout is through the Reserve Auxiliary Transformers (RATs) from the power grid via the 230 kV switchyard, and the 230 kV power circuit breakers represent the scoping boundary. Figure 2.1.2.3.5-1, "Plant Vogtle License Renewal Offsite Power for SBO," shows that 230 kV circuit breakers 161860 and 161960 for Offsite Power Source 1 and 230 kV circuit breakers 161820 and 161920 for Offsite Power Source 2 represent the scoping boundary. Hence, the scoping boundary is in accordance with SRP-LR Section 2.5.2.1.1, and the staff finds this acceptable.

2.5.3 Conclusion

The staff reviewed the LRA and UFSAR to determine whether the applicant failed to identify any SCs 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 the applicant has adequately identified the electrical component types 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).

2.6 Conclusion for Scoping and Screening

The staff reviewed the information in LRA Section 2, "Structures and Components Subject to AMR." The staff concludes that the applicant's scoping and screening methodology is consistent with 10 CFR 54.21(a)(1) requirements and the staff's position on the treatment of safety-related and nonsafety-related SCs within the scope of license renewal and that the SCs requiring 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 that the applicant has adequately identified 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 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), with the Atomic Energy Act of 1954, as amended, and with NRC regulations.

SECTION 3

AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation report (SER) evaluated aging management programs (AMPs) and aging management reviews (AMRs) for Vogtle Electric Generating Plant (VEGP) Units 1 and 2, by the staff of the United States (U.S.) Nuclear Regulatory Commission (NRC) (the staff). In Appendix B of its license renewal application (LRA), Southern Nuclear Operating Company, Inc. (SNC or the applicant) described the 38 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 NUREG-1801, 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 has determined 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 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 staffs review was in accordance with Title 10, Part 54, of the *Code of Federal Regulations* (10 CFR Part 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 audit of selected AMRs and associated AMPs, during the weeks of October 15 - 19, 2007 and December 10 - 14, 2007. The audits and reviews are designed for maximum efficiency of the staff’s LRA review. The applicant can respond to questions, 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) by letter dated April 7, 2003 (Agencywide Documents Access and Management System (ADAMS) No. 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 VEGP application is essentially the same. The intent of the revised format of the VEGP 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 Report 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 system, engineered safety features, auxiliary systems, etc.). For example, the engineered safety features group has tables specific to the containment spray system, containment isolation system, and emergency core cooling system. Each Table 2 consists of nine columns:

- Component Type – The first column lists LRA Section 2 component types subject to an AMR in alphabetical order.
- Intended Function – The second column identifies the license renewal intended functions for the listed component types. Definitions of intended functions are in LRA Table 2.1.3.
- Material – The third column lists the particular construction material(s) for the component type.
- 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.
- Aging Effect Requiring Management – The fifth column lists aging effects requiring management (AERMs). As part of the AMR process, the applicant determined any AERMs for each combination of material and environment.
- Aging Management Programs – The sixth column lists the AMPs that the applicant uses to manage the identified aging effects.

- GALL Report Vol. 2 Item – The seventh column lists the GALL Report item(s) identified in the LRA as similar to the AMR results. The applicant compared 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.

- 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 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.

- 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 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 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 aging effects 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.

(1) Scope of the Program – Scope of the program should include the specific SCs subject to an AMR for license renewal.

(2) Preventive Actions – Preventive actions should prevent or mitigate aging degradation.

(3) Parameters Monitored or Inspected – Parameters monitored or inspected should be linked to the degradation of the particular structure or component intended function(s).

(4) 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.

(5) Monitoring and Trending – Monitoring and trending should provide predictability of the extent of degradation, as well as timely corrective or mitigative actions.

(6) 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 under all CLB design conditions during the period of extended operation.

(7) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(8) Confirmation Process – 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 for a formal review and approval process.

(10) 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.

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 column seven of the LRA, "NUREG-1801 Vol. 2 Item," correlate to an AMR combination as identified in the GALL Report. The staff also conducted 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 aging effects 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 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 section of this SER in which the staff's evaluation of the program is documented.

Table 3.0.3-1 VEGP Aging Management Programs

AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
ACCW System Carbon Steel Components Program (B.3.1)	New	Plant-specific		reactor vessel, reactor vessel internals, and reactor coolant system / auxiliary systems	3.0.3.3.1
Bolting Integrity Program (B.3.2)	New	Plant-specific		reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.3.2
Boric Acid Corrosion Control Program (B.3.3)	Existing	Consistent with enhancements	XI.M10	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / containments, structures, and component supports / electrical and instrumentation and controls components	3.0.3.2.1
Buried Piping and Tanks Inspection Program (B.3.4)	New	Consistent with exceptions	XI.M34	auxiliary systems / steam and power conversion systems	3.0.3.2.2
CASS RCS Fitting Evaluation Program (B.3.5)	New	Consistent with exception	XI.M12	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.3
Closed Cooling Water Program (B.3.6)	Existing	Consistent with exceptions and enhancements	XI.M21	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems	3.0.3.2.4
Diesel Fuel Oil Program (B.3.7)	Existing	Plant-specific		auxiliary systems	3.0.3.3.3

AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
External Surfaces Monitoring Program (B.3.8)	New	Consistent with exceptions	XI.M36	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.2.5
Fire Protection Program (B.3.9)	Existing	Consistent with exceptions and enhancements	XI.M26 XI.M27	auxiliary systems / containments, structures, and component supports	3.0.3.2.6
Flow-Accelerated Corrosion Program (B.3.10)	Existing	Consistent with exceptions	XI.M17	reactor vessel, reactor vessel internals, and reactor coolant system / auxiliary systems	3.0.3.2.7
Flux Thimble Tube Inspection Program (B.3.11)	Existing	Consistent with enhancement	XI.M37	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.8
Generic Letter 89-13 Program (B.3.12)	Existing	Consistent with exception and enhancements	XI.M20	engineered safety features systems / auxiliary systems	3.0.3.2.9
Inservice Inspection Program (B.3.13)	Existing	Plant-specific		reactor vessel, reactor vessel internals, and reactor coolant system / auxiliary systems / containments, structures, and component supports	3.0.3.3.4
Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations (B.3.14)	New	Plant-specific		reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.3.5
Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations (B.3.15)	Existing	Consistent	XI.M11A	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.1.1
Oil Analysis Program (B.3.16)	Existing	Consistent with exception and enhancements	XI.M39	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.2.10

AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
One-Time Inspection Program (B.3.17)	New	Consistent	XI.M32	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.1.2
One-Time Inspection Program for ASME Class 1 Small Bore Piping (B.3.18)	New	Consistent with exceptions	XI.M35	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.11
One-Time Inspection Program for Selective Leaching (B.3.19)	New	Consistent with exception	XI.M33	engineered safety features systems / auxiliary systems	3.0.3.2.12
Overhead and Refueling Crane Inspection Program (B.3.20)	Existing	Consistent	XI.M23	auxiliary systems	3.0.3.1.3
Periodic Surveillance and Preventive Maintenance Activities (B.3.21)	Existing	Plant-specific		auxiliary systems / steam and power conversion systems / containments, structures, and component supports	3.0.3.3.6
Piping and Duct Internal Inspection Program (B.3.22)	New	Consistent with exceptions	XI.M38	engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.2.13
Reactor Vessel Closure Head Stud Program (B.3.23)	Existing	Consistent with exceptions	XI.M3	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.14
Reactor Vessel Internals Program (B.3.24)	New	Plant-specific		reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.3.7
Reactor Vessel Surveillance Program (B.3.25)	Existing	Consistent with exceptions and enhancements	XI.M31	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.15
Steam Generator Tubing Integrity Program (B.3.26)	Existing	Consistent with exception	XI.M19	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.16
Steam Generator Program for Upper Internals (B.3.27)	Existing	Plant-specific		reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.3.8

AMP (LRA Section)	New or Existing AMP	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Water Chemistry Control Program (B.3.28)	Existing	Consistent	XI.M2	reactor vessel, reactor vessel internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / containments, structures, and component supports	3.0.3.1.4
10 CFR 50 Appendix J Program (B.3.29)	Existing	Consistent	XI.S4	containments, structures, and component supports	3.0.3.1.5
Inservice Inspection Program - IWE (B.3.30)	Existing	Plant-specific		containments, structures, and component supports	3.0.3.3.9
Inservice Inspection Program - IWL (B.3.31)	Existing	Plant-specific		containments, structures, and component supports	3.0.3.3.10
Structural Monitoring Program (B.3.32)	Existing	Consistent with enhancements	XI.S6	containments, structures, and component supports	3.0.3.2.17
Structural Monitoring Program - Masonry Walls (B.3.33)	Existing	Consistent with enhancement	XI.S5	containments, structures, and component supports	3.0.3.2.18
Non-EQ Cables and Connections Program (B.3.34)	New	Consistent	XI.E1	electrical and instrumentation and controls components	3.0.3.1.6
Non-EQ Inaccessible Medium-Voltage Cables Program (B.3.35)	New	Consistent	XI.E3	electrical and instrumentation and controls components	3.0.3.1.7
Non-EQ Cable Connections One-Time Inspection Program (B.3.36)	New	Plant-specific		electrical and instrumentation and controls components	3.0.3.3.11
Environmental Qualification Program (B.3.37)	Existing	Consistent	X.E1	electrical and instrumentation and controls components	3.0.3.1.8
Fatigue Monitoring Program (B.3.38)	Existing	Consistent with enhancements	X.M1	reactor vessel, reactor vessel internals, and reactor coolant system	3.0.3.2.19

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:

- Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations
- One-Time Inspection Program
- Overhead and Refueling Crane Inspection Program
- Water Chemistry Control Program
- 10 CFR 50 Appendix J Program
- Non-EQ Cables and Connections Program
- Non-EQ Inaccessible Medium-Voltage Cables Program
- Environmental Qualification Program

3.0.3.1.1 Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations

Summary of Technical Information in the Application LRA Section B.3.15 describes the existing Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations as consistent with GALL AMP XI.M11A, "Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors."

The applicant stated that development of the existing Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations program addressed industry concerns about potential primary water stress corrosion cracking (PWSCC) in nickel alloy components exposed to reactor coolant. The program is based upon NRC First Revised Order EA-03-009, which established requirements for susceptibility ranking and inspections.

Susceptibility ranking based on calculated effective degradation years and the results of previous inspection findings determines inspection frequencies.

The applicant also stated that detection of cracking is by a combination of bare metal visual examinations of 100 percent of each reactor vessel head surface, including 360 º around each reactor vessel head penetration nozzle, and nonvisual techniques requiring either (1) ultrasonic testing of each reactor vessel head penetration nozzle (*i.e.*, nozzle base metal) from two inches above the J-groove weld to the bottom of the nozzle and a assessment for leakage into the interference fit zone or (2) eddy-current or dye-penetrant testing of the wetted surface of each J-groove weld and reactor vessel head penetration base metal to at least two inches above the J-groove weld. Additionally, general visual inspection at each refueling outage detects potential borated water leaks from pressure-retaining components above the reactor vessel head.

The applicant further stated that the current program includes one relaxation and one alternative from First Revised Order EA-03-009 inspection requirements. These deviations from the requirements are not exceptions to the GALL Report Revision 1, Section XI.M11A program because they were approved by the staff (consistent with Section IV.F of the order).

1) Order EA-03-009, Section IV.C(5)(a), specifies for bare metal visual examination coverage of the reactor vessel head surface. Full examination coverage is not possible without removal of reflective metal insulation. A minimum additional dose of 10 rem is necessary for examination of the less than one percent of the vessel head surface obscured by the insulation in an area where leakage is not likely to initiate. The applicant requested from the staff relaxation of inspection for the small surface of the reactor vessel head obscured by insulation. A September 2005 Safety Evaluation (ADAMS No granted relaxation.

2) Order EA-03-009, Section IV.C(5)(b), specifies examination volume for reactor vessel head penetration nozzle base material. Full examination volume coverage by ultrasonic testing is not possible due to geometry. Specifically, the bottom ends of the nozzles are threaded, internally tapered, or both, making ultrasonic inspection in accordance with First Revised Order EA-03-009 a hardship due to the need for an increased radiation dose to implement surface examination options. The applicant proposed to the staff ultrasonic testing of nozzle ends to the maximum extent possible. The staff in an August 2006 Safety Evaluation (ADAMS No approved this alternate approach.

The program will implement commitments for reactor vessel closure head penetrations of nickel alloys from (1) NRC orders, bulletins, and generic letters and (2) staff-accepted industry guidelines.

Staff Evaluation During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff's recommended program for reactor vessel closure head (RVCH) and its penetration nozzles is GALL AMP XI.M11-A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Head of Pressurized Water Reactor Program. The program elements of this GALL program are based on compliance with the staff's augmented inspection requirements for pressurized water reactors (PWR) reactor vessel closure heads (RVCH) and their penetration nozzles. These augmented inspection requirements were originally defined in NRC Order EA-03-009 and amended in the First Revised Order EA-03-009 (henceforth these Orders will be referred to collectively as the Order).

The Order requires U.S. holders of operating licenses for PWRs to perform an integrated plant susceptibility model calculation of their upper RVCHs and their penetration nozzles and to establish the ranking in terms of an effective degradation year (EDY) parameter, as follows:

- High susceptibility: either plants with an EDY greater than 12 EDY or plants with a RVCH that has experience cracking in a penetration nozzle or J-groove weld due to PWSCC

- Moderate susceptibility: plants with a calculated value of EDY less than or equal to 12 and greater than or equal to 8 AND no previous inspection findings requiring classification as High

- Low susceptibility: plants with a calculated value of EDY less than 8 AND no previous inspection findings requiring classification as High

- Replaced Category: plants with a replaced RPV head AND with a calculated value of EDY less than 8 AND no previous inspection findings requiring classification as High

The Order requires that licensees to perform a combination of bare metal visual (BMV) examinations on their upper RVCHs and non-visual examinations (i.e., either penetrant test [PT] or magnetic particle test [MT] surface examination techniques or ultrasonic test [UT] or eddy current test [ET] volumetric examination techniques) on their upper RVCH penetration nozzles. Based on the susceptibility calculation result, the Order requires these licensees perform the augmented inspections based on the following frequency requirements:

- High susceptibility: the BMV examination of the upper RVCH and the non-visual examinations of the upper RVCH penetration nozzles are required to be performed once every refueling outage.

- Moderate susceptibility: either a BMV examination of the upper RVCH or the non-visual examinations of the upper RVCH penetration nozzles is required to be performed once every refueling outage, with added requirement that the BMV examination of the upper RVCH and the non-visual examinations of the RVCH penetration nozzles are required to be performed at least once of the course of every 2 refueling outages.

- Low susceptibility: the BMV examination of the upper RVCH is to be performed once every 3rd refueling outage or every five years, which ever comes first. The non-visual examinations of the upper RVCH penetration nozzles are to be performed once every 4th refueling outage or every seven years, whichever comes first.

- Replaced Category: the inspection frequency requirements are similar to those for low susceptibility heads with the exception of minor variations.

The Order also requires a licensee to re-rank the susceptibility of its RVCH (including the penetration nozzle base metal and partial penetration J-groove weld materials) into the High susceptibility category if any of the augmented inspections result in the detection of degradation of the RVCH or its penetration nozzles and to follow the implementation schedule for High susceptibility RVCHs.

The staff reviewed the applicant's license renewal basis evaluation document for the applicant's Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations, as well as the applicant's responses to the Order and applicable SNC-corporate and VEGP-specific procedures that are relevant to the applicant's augmented inspection program for the RVCH and its penetration nozzles. The staff concludes that the applicant's Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations is an augmented condition monitoring program that is designed to comply with the augmented inspection requirements in the NRC's First Revised Order EA-03-009 for RVCH and its penetration nozzles and to conform with the recommended program elements in GALL AMP XI.M11-A.

The staff concludes that the scope of the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations includes the upper RVCHs and their penetration nozzles. The staff concludes that these nozzles include both the control rod drive mechanism (CRDM) penetration nozzles (78 in total), RVCH instrumentation nozzles, and the upper RVCH vent nozzle. This is consistent with "scope of program" program element in GALL AMP XI.M11-A, and is acceptable.

The staff also determined that the scope of the applicant's program includes the applicant's response to Order EA-03-009 dated March 3, 2003, as amended in the applicant's letter of March 8, 2004. These documents provide the applicant consent to comply with the requirements of the Order and to establish an augmented inspection program for the upper RVCHs and their penetration nozzles.

The staff concludes that the program includes both BMV examinations of the RVCH surfaces to look for signs of reactor coolant leakage and boric acid-induced wastage of the RVCHs and for indications of cracking in the penetration nozzles or their partial penetration J-groove welds, which is usually initiated as result of PWSCC. This is in compliance with the Order and is consistent with the "parameters monitored" program element in GALL AMP XI.M11-A and is acceptable.

The staff concludes that the applicant's response letter of March 8, 2004, indicates that the applicant will perform BMV examinations of the outside surface of the RVCH and UT of the RVCH penetrations nozzles extending from 2 inches above the J-groove penetration down to the majority of the length below to J-groove weld. The staff concludes that the applicant requested minor relaxations of the 100 percent coverage requirements for the BMV examinations in the response letter of March 8, 2004, and for the UT examinations requirements in a letter dated May 18, 2006. The NRC granted the relaxation on the BMV requirements in a safety evaluation dated September 13, 2005 and the relaxation on the UT requirements in a safety evaluation dated August 30, 2006. These relaxations are in accordance with the relaxation request provisions of Order EA-03-009 and are consistent with the guidance in GALL AMP XI.M11-A.

The staff concludes that the applicant currently implements its augmented BMV and UT examinations in accordance with the inspection frequency for Low susceptibility RVCHs, as based on the EDY information submitted in the SNC letters of June 6, 2005 for Unit 1 and June 28, 2005 for Unit 2, and on the relaxed augmented inspection criteria that were approved in the NRC's safety evaluations of September 13, 2005, and August 30, 2006.

This is in compliance with the requirements of the Order and is consistent with the "detection of aging effects" and "monitoring and trending" program elements of GALL AMP XI.M11-A, and is acceptable.

The staff concludes that the applicant's uses the acceptance criteria in the NRC letter of April 11, 2003 as the basis for evaluating any indications of degradation that may result from its augmented examinations. This is consistent with the "acceptance criteria" program element in GALL AMP XI.M11-A and is acceptable.

Based on this assessment, the staff concludes that AMP B.3.15, Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations, is consistent with the program elements in GALL AMP XI.M11-A without exception and is acceptable.

<u>Operating Experience</u> LRA Section B.3.15 states that to date the VEGP Units 1 and 2 reactor vessel heads remain in the "Low" susceptibility category requiring bare metal visual examination every third refueling outage or every five years (whichever comes first) and nonvisual examination every fourth refueling outage or every seven years (whichever comes first).

The LRA Section B.3.15 provides the following additional information relative to this operating experience:

> In the most recent inspection of the Unit 1 reactor vessel head in the fall of 2006 nonvisual examination found no degradation in any of 78 control rod drive mechanism penetrations or the reactor vessel head vent penetration. General visual inspection at the same time detected boron residue on one of four conoseal assemblies. Cleaning and reinspection of the areas below the conoseals found no degradation. In the most recent inspection of the Unit 2 reactor vessel head in the spring of 2007 nonvisual examination found no degradation in any of 78 control rod drive mechanism penetrations or in the reactor vessel head vent penetration. General visual inspection at the same time detected no indications of leakage.
>
> Implementation and maintenance of the Nickel Alloy Management Program are in accordance with general requirements for engineering programs. Periodic program reviews ensure compliance with regulatory, process, and procedural requirements.

The applicant's license renewal basis evaluation document of relevant industry operating experience indicates that the generic operating experience on PWSCC of upper RVCH penetration nozzles, as discussed in NRC Bulletins 2001-01 and 2002-01 and in the Order, and on loss of material of upper RVCHs induced by reactor coolant leakage and boric acid induced corrosion, as discussed in the Order, is applicable to the RVCHs at VEGP and their penetration nozzles. The applicant indicated that the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations is implemented to monitor for the potential to occur in the RVCHs at VEGP or their penetration nozzles (including the partial penetration J-groove welds).

The staff noted that the SNC submittals of June 6, 2005 for Unit 1 and June 28, 2005 for Unit 2 indicate that applicant has been implementing the required augmented inspection for Low susceptibility RVCHs based on an EDY of 3.01 for the Unit 1 RVCH and an EDY of

2.67 for Unit 2 RVCH. The staff also noted that the submittals of June 6, 2005 for Unit 1 and June 28, 2005 also document the results of the applicant’s augmented inspections that were performed during the Spring 2005 refueling outage (RFO #1R12) for Unit 1 and during the Spring 2004 refueling outage (RFO #2R10) for Unit 2 and indicate the inspections performed during these outages did not reveal the presence of any indications in the upper RVCHs or their penetration nozzles. Based on this assessment, the staff concludes that the applicant has factored the relevant operating experience for the RVCHs of U.S. PWRs into the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations and has been implementing this augmented inspection program in accordance with the requirements of the Order.

Based on this review, the staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.15, the applicant provided the UFSAR supplement for the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations. 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). The staff verified that the LRA includes Commitment No. 13 to implement the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations in accordance with the program elements for AMP B.3.15 and the UFSAR supplement criteria for this AMP, as defined in LRA Section A.2.1.15. This commitment was submitted in the applicant’s letter dated June 27, 2007 and requires the applicant to implement this program in accordance of the following bases: (1) applicable NRC Orders, Bulletins, and Generic Letters, and (2) NRC-approved industry guidance.

The Order, as discussed in the evaluation section for this AMP, provides the current licensing basis (CLB) for augmented examinations of PWR upper RVCHs and their penetration nozzles. The NRC staff incorporated these requirements into the program elements for GALL AMP XI.M11-A when it issued the AMP as part of GALL, Revision 1 (September 2005). Therefore, the provisions of Commitment No. 13 are consistent with the applicant’s basis to perform its augmented inspection of the RVCHs and their penetration nozzles in accordance with the requirements of the Order and with the guidelines of GALL AMP XI.M11-A. Based on this assessment, the staff concludes that implementation of Commitment No. 13 will provide continued assurance that the applicant will implement the requirements of the Order during the period of extended operation, or until that time when new augmented requirements for RVCHs and their penetration nozzles can be developed and incorporated into a version of the ASME Code Section XI that is endorsed by reference in the requirements of 10 CFR 50.55a, “Codes and Standards.”

Conclusion On the basis of its audit and review of the applicant’s Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations, 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 One-Time Inspection Program

Summary of Technical Information in the Application LRA Section B.3.17 describes the new One-Time Inspection Program as consistent with GALL AMP XI.M32, "One-Time Inspection."

The applicant stated that the One-Time Inspection Program proves objectively that an aging effect has not occurred or occurs so slowly as not to affect the component or structure intended function during the period of extended operation and therefore requires no additional aging management. The new One-Time Inspection Program will verify the effectiveness of AMPs or confirm the insignificance of potential aging effects by one-time inspections of plant piping and components where (a) an aging effect probably will not occur but there is insufficient data to rule it out with reasonable confidence, (b) an aging effect probably will progress very slowly in a specified environment but conditions may be more adverse than those specified, or (c) the aging effect has a long incubation period relative to the operating life of the plant.

The inspections will be within the ten years preceding the period of extended operation.

The applicant further stated that the One-Time Inspection Program will include (a) determination of sample size based on assessment of materials of fabrication, environment, plausible aging effects, and operating experience, (b) selection of system or component inspection locations based on the aging effect, (c) determination of examination techniques, including acceptance criteria, effective in detecting and quantifying the aging effect, and (d) evaluation of the need for further examinations to monitor aging progression, expand sample size, or take other corrective actions as appropriate if age-related degradation could affect an intended function before the end of the period of extended operation. The One-Time Inspection Program for Selective Leaching addresses inspections of components potentially susceptible to such degradation. The One-Time Inspection Program for ASME Class 1 Small Bore Piping addresses inspections of American Society of Mechanical Engineers (ASME) Code Class 1 piping less than or equal to nominal pipe size (NPS) 4.

Staff Evaluation During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the One-Time Inspection Program basis documents. Specifically, the staff reviewed the program elements and corresponding basis documents for consistency with GALL AMP XI.M32. The staff concludes that the program element descriptions in the One-Time Inspection Program conformed to the corresponding program elements in GALL AMP XI.M32, "One-Time Inspection." The staff finds the applicant's One-Time Inspection Program consistent with the recommended GALL AMP XI.M32 and acceptable.

In Enclosure 2 of letter dated, June 27, 2007, the applicant provided Commitment No. 15 to implement the One-Time Inspection Program as described in LRA Section B.3.17 and to perform the inspections under this program within a ten year window prior to the period of extended operation. The staff finds this commitment acceptable, because the resulting program will address the recommendations of the GALL Report and be consistent with GALL AMP XI.M32.

Operating Experience LRA Section B.3.17 states that there is no programmatic operating experience specifically applicable to the new one-time inspections but that selection of the initial component sample sets will consider plant-specific and industry operating experience.

During the on-site audit, the staff confirmed that VEGP has ongoing programs to monitor industry and site operating experience. These programs include mechanisms to update or modify plant procedures or practices to incorporate lessons learned.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.17, the applicant provided the UFSAR supplement for the One-Time Inspection Program. The staff reviewed the applicant’s license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that this program is identified as Commitment No. 15 to be implemented prior to the period of extended operation. The staff reviewed LRA Section A.2.17 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 One-Time Inspection Program, the staff finds that, upon the implementation of Commitment No. 15, all program elements are 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 Overhead and Refueling Crane Inspection Program

Summary of Technical Information in the Application LRA Section B.3.20 describes the existing Overhead and Refueling Crane Inspection Program as consistent with GALL AMP XI.M23, “Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.”

The applicant stated that the Overhead and Refueling Crane Inspection Program manages the effects of general corrosion and wear of crane bridge and trolley structural girders and beams and crane rails and support girders within the scope of license renewal. The Overhead and Refueling Crane Inspection Program monitors conditions in the following nuclear safety-related and quality-related material handling systems: refueling machine, fuel handling machine bridge crane, spent fuel cask bridge crane, and containment building (reactor) polar crane. The Overhead and Refueling Crane Inspection Program is based on American National Standards Institute (ANSI) B30.2 guidance for overhead cranes. NUREG-0612 provides the basis for inspection of the cranes.

Staff Evaluation During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

During the audit and review, the staff noted that LRA Section B.3.20, Overhead and Refueling Crane Inspection Program, states that the program is an existing program that is consistent with GALL AMP XI.M23. The applicant also states in the VEGP basis document for AMP B.3.20 that the program is consistent with GALL AMP XI.M23. The program basis document, under the program element "detection of aging effects", states that for the cranes within the scope of license renewal, crane rails and crane structural components are routinely visually inspected for excessive wear, corrosion, or misalignment. However, a review of the existing program implementation (inspection) procedures for the polar cranes, refueling machines (bridge and trolley system) and fuel handling machine bridge cranes shows that the polar cranes are not inspected for corrosion and crane rail wear, the refueling machines are not inspected for corrosion and the fuel handling bridge cranes structural components are not shown as being inspected. The staff asked the applicant to explain how the existing VEGP AMP B.3.20, Overhead and Refueling Crane Inspection Program is consistent with GALL AMP XI.M23 when the existing program does not address the above inspections.

In its response, the applicant stated the cranes within the scope of the Overhead and Refueling Crane Inspection Program are routinely inspected, however the existing procedures do not explicitly identify inspection of structural components for excessive wear, corrosion, and misalignment in all cases.

As a result, the applicant will enhance applicable plant procedures to explicitly identify inspection of crane rails and crane structural components for loss of material due to corrosion and wear, and for indication of rail misalignment.

In its letter dated, August 11, 2008, the applicant revised the LRA to enhance the program element "detection of aging effects" by revising the program implementing procedures for the cranes within the scope of license renewal to require that visual inspections for excessive wear, corrosion, or misalignment of crane rails and crane structural components be routinely performed. In the same letter, the applicant provided Commitment No. 34 to enhance the Overhead and Refueling Crane Inspection Program prior to the period of extended operation.

The staff finds the applicant's response acceptable because it explains that currently the existing VEGP program implementation (inspection) procedures for the refueling machines, fuel handling machine bridge cranes, spent fuel cask bridge crane, and polar cranes do not all routinely visually inspect for excessive wear, corrosion, or misalignment of crane rails and crane structural components.

The staff reviewed those portions of the Overhead and Refueling Crane Inspection Program for which the applicant claims consistency with GALL AMP XI.M23 and found that they are consistent with the GALL Report AMP. Furthermore, the staff concludes that the applicant's Overhead and Refueling Crane Inspection Program will properly manage the aging of the crane bridge and trolley structural girders, beams, crane rails and support girders for the period of extended operation.

The staff finds the applicant's Overhead and Refueling Crane Inspection Program acceptable because it conforms to the recommended GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," with the enhancement as described below.

The enhancement evaluation that follows is based on the applicant's license renewal amendment to enhance the Overhead and Refueling Crane Inspection Program.

Enhancement The applicant's license renewal amendment states an enhancement to the following GALL Report program element:

Element:	4: detection of aging effects
Enhancement:	Revise plant procedures for the refueling machines, fuel handling machine bridge cranes, spent fuel cask bridge crane, and polar cranes to routinely visually inspect for excessive wear, corrosion, or misalignment of crane rails and crane structural components.

The staff finds this enhancement acceptable, since the enhanced program implementing procedures will address the recommendations of the GALL Report and be consistent with the "detection of aging effects" program element.

On this basis, the staff finds the applicant's Overhead and Refueling Crane Inspection Program acceptable since when the enhancement is implemented; the program will be consistent with GALL AMP XI.M23 and will provide assurance that the effects of aging will be adequately managed.

Operating Experience LRA Section B.3.20 states that the operating history of the overhead and refueling cranes shows no significant degradation of the crane bridge and trolley structural girders and beams or of the crane rails and support girders and that the program has managed aging effects for the overhead and refueling cranes effectively.

The applicant stated that the inspections from 2001 to 2006 detected minor degradation like misalignment of crane rails, loose crane rail hold-down bolts, wire rope reeving problems, reductions in wire rope diameter, wear on a fuel-handling crane roller assembly, and minor flaw indications. The Corrective Actions Program evaluated the reported conditions and resolved them.

During the audit and review, the staff reviewed operating experience discussed in the LRA and in the basis document for the Overhead and Refueling Crane Inspection Program. A condition report was reviewed by the staff in which inservice inspection (ISI) found a linear indication on each side of the web section weld for the beam of the pendant take up drum for the spent fuel cask crane. The indications were removed by grinding. The AISC Manual of Steel Construction was reviewed by the staff to determine the permissible variations and standard mill practices for rolled steel sections. Based on the manual, it was concluded by the staff, that the indications found along the beam web section weld were not structurally significant.

Another condition report reviewed by the staff identified the rails of the spent fuel cask crane as being out of alignment with numerous loose hold down bolts. The rails were re-aligned and the hold down bolts tightened with a requirement added to check their tightness every five years.

An additional condition report reviewed by the staff identified flaw indications in two studs in a crane rail plate clamp for the Unit 2 polar crane. The disposition was to use the studs as is since there was adequate rail clamps structurally on both sides of the flawed studs clamp.

The staff finds that the review of the operating experience documented in the LRA and basis document for the Overhead and Refueling Crane Inspection Program did not reveal any unusual or significant findings.

On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Overhead and Refueling Crane Inspection Program will adequately manage the aging effects for which the AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.20, the applicant provided the UFSAR supplement for the Overhead and Refueling Crane Inspection Program. The staff reviewed the applicant's license renewal commitment list dated August 11, 2008, and confirmed that this program (enhancement to this program) is identified as Commitment No. 34 to be implemented prior to the period of extended operation. The staff concludes 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 Overhead and Refueling Crane Inspection Program, the staff concludes that those program elements for which the applicant claimed consistency with the GALL Report are consistent. 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 Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 Water Chemistry Control Program

<u>Summary of Technical Information in the Application</u> LRA Section B.3.28 describes the existing Water Chemistry Control Program as consistent with GALL AMP XI.M2, "Water Chemistry."

The applicant stated that the Water Chemistry Control Program mitigates loss of material, cracking, and heat transfer reduction in system components and structures through the control of water chemistry. The program controls detrimental chemical species and adds chemical agents. The program is based on the Electric Power Research Institute (EPRI) water chemistry guidelines for primary and secondary water chemistry control:

- *Pressurized Water Reactor Primary Water Chemistry Guidelines: Volumes 1 and 2, Revision 5*, EPRI, Palo Alto, CA, 2003. 1002884 and

- *Pressurized Water Reactor Secondary Water Chemistry Guidelines, Revision 6*, EPRI, Palo Alto, CA, 2004. 1008224.

Water Chemistry Control Program updates follow releases of EPRI guideline revisions. The One-Time Inspection Program includes inspections to verify Water Chemistry Control Program effectiveness.

<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 information in LRA AMP B.3.28, Water Chemistry Control Program, the license renewal (LR) basis evaluation document, and applicant SNC-specific and VEGP-specific procedures that pertain to the design, details, and implementation of this AMP. In LRA AMP B.3.28, the applicant identifies that the Water Chemistry Control Program is an existing plant-specific AMP that is consistent, without exception, with the NRC recommended guidelines and program elements in GALL AMP XI.M2, "Water Chemistry."

The staff noted that the "scope of program" program element for the Water Chemistry Control Program states that the program calls for periodic monitoring and control of detrimental contaminants, such as chlorides, fluorides, dissolved oxygen, and sulfates. The staff concludes that this is consistent with the criteria for programmatic monitoring and water chemistry control recommended in the "scope of program" program element of GALL AMP XI.M2, "Water Chemistry.

The staff also noted that the "scope of program" program element for the applicant's Water Chemistry Control Program states that the program applies the EPRI Primary Water Chemistry Guidelines in EPRI Report No. 1002884 and the EPRI Secondary Water Chemistry Guidelines in EPRI Report No. 1008224 as the basis for implementing the primary and secondary water chemistry control process activities for the applicant's primary coolant (i.e, the reactor coolant) and secondary coolants. The staff reviewed the "scope of program" program element criterion in GALL AMP XI.M2, "Water Chemistry," and determined that the GALL criterion recommends that the primary water chemistry guidelines in EPRI Report No. TR-105714 and the secondary water chemistry guidelines in EPRI Report No.TR-102134 as the bases for PWR primary and secondary water chemistry control. However, the staff also noted the "scope of program" program element in GALL AMP XI.M2 permits license renewal applicants to apply more recent versions of the EPRI primary and secondary water chemistry guidelines as the basis for the water chemistry monitoring and controls at their facilities. The staff noted that the water chemistry guidelines credited by the applicant for license renewal are the most recent editions of the primary and secondary PWR water chemistry guidelines that have been developed and issued by EPRI, and these guidelines are updates to the versions of the report mentioned in the GALL AMP XI.M2. Based on this assessment, the staff concludes that the applicant's use and crediting of EPRI Primary Water Chemistry Guidelines in EPRI Report No. 1002884 and the EPRI Secondary Water Chemistry Guidelines in EPRI Report No. 1008224 for aging management is acceptable because it meets the alternative provision in GALL AMP XI.M2 that license renewal applicant's may apply and use more recent versions of EPRI primary and secondary water chemistry guidelines as the basis for controlling the chemistry of their facilities' primary and secondary coolants.

The staff noted from its review of the LR basis evaluation document that the remaining program elements for the applicant's Water Chemistry Control Program were consistent with the program element criteria recommended in GALL AMP XI.M2, "Water Chemistry," with the exception of the following aspects of the program that need additional clarification.

With regard to the applicant's "scope of program" program element, the staff asked the applicant to provide its basis why pH is only used as a diagnostic parameter, given that low pH can lead to stress corrosion-induced cracking and high pH can lead to caustic cracking of stainless steel and inconel materials.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant provided clarification that the reference for pH control pertains solely to sampling requirements and water chemistry testing of secondary-side coolant in the steam generator blowdown processing system, and that for sampling and testing of steam generator blowdown coolant, the PWR secondary water chemistry guidelines in EPRI Report No. 1008224 use a pH diagnostic parameter, not a water chemistry control parameter. In its response, the applicant further stated that the applicant continuously monitors for steam generator blowdown coolant online and samples the steam generator blowdown coolant weekly and tests the coolant samples for pH. The applicant further stated that if an adverse trend in pH is identified, corrective actions are taken to identify and correct the factors causing the trend. The staff finds the applicant's response acceptable because it clarifies the EPRI secondary water chemistry guidelines used by the applicant do not recommend that pH be used as a water chemistry control parameter and because the response clarifies that the applicant does take appropriate corrective actions if adverse trends in steam generator blowdown coolant pH are noted.

Based on this review the staff concludes that the applicant does not need to establish limits on steam generator blowdown coolant pH because pH is not used as a control parameter for steam generator blowdown coolant pH and because the applicant does take appropriate corrective actions if adverse trends in steam generator blowdown coolant pH are noted. This question is resolved.

With regard to the applicant's "parameters monitored/inspected" program element, the staff asked the applicant to clarify whether the EPRI secondary water chemistry guidelines included appropriate monitoring and control guidelines for chemical control and additive species in the boric acid storage, refueling water storage, spent fuel pool, letdown purification system, and chemical and volume control tanks, and if so, to clarify what the parameters are and to identify by reference or by direct response what the limits or specifications are for the parameters and what the sampling frequencies are for monitoring for these parameters.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant provided clarification that Appendix B of the EPRI primary water chemistry guidelines for PWR (as described in EPRI Report No. 1002884) addresses chemistry control practices for systems that interface with the reactor coolant system, and it also provides suggestions for parameters to be monitored and the frequencies of sampling and monitoring testing. The applicant further stated that these EPRI guidelines do not establish any chemistry control parameter limitations or action levels for systems that interface with the reactor coolant system. The applicant stated that, in general, monitoring of water chemistry in the boric acid storage, refueling water storage, spent fuel pool, letdown purification system, and chemical and volume control tanks is done for the purpose of minimizing the potential ingress of detrimental chemical species into the reactor coolant system. The staff finds the applicant's response to be acceptable because it clarifies the EPRI primary water chemistry guidelines (as described in EPRI Report No. 1002884) used by the applicant do not establish water chemistry limits or action levels for the water chemistry parameters that are monitored for in the boric acid storage tank, refueling water storage tank, spent fuel pool, letdown purification system, and chemical and volume control tank coolant inventories. Based on this review the staff concludes that the applicant does not need to establish chemistry parameter limits or action levels for these coolants because the EPRI primary water chemistry guidelines for PWRs do not establish chemistry parameter limits for these systems and because the applicant is using a version of the EPRI primary water chemistry guidelines that have been endorsed for use in GALL AMP XI.M2, Water Chemistry." This question is resolved.

Based on this review, the staff concludes that the applicant's program elements for the Water Chemistry Control Program are consistent with the corresponding program element criteria that are recommended in GALL AMP XI.M2, Water Chemistry," and that the Water Chemistry Program will be capable of controlling the water chemistry of the VEGP primary and secondary coolants and of mitigating the corrosive-induced aging effects in the system and components for which the program is credited.

Based on this assessment, the staff concludes that the applicant's Water Chemistry Control Program is acceptable because the program elements for the AMP are consistent with the corresponding program element criteria recommend in GALL AMP, XI.M2, "Water Chemistry."

<u>Operating Experience</u> LRA Section B.3.28 states that the Water Chemistry Control Program is based upon EPRI water chemistry guidelines developed from plant experience, research data, and expert opinion. Industry by consensus periodically updates and improves these guidelines.

LRA Section B.3.28 provides that following additional information relative to the water chemistry experience at VEGP:

> On the primary side, VEGP has experienced increased silica concentrations in the spent fuel pool due to the leaching from the Boraflex spent fuel racks. Silica cannot be removed by ion exchange. VEGP monitors silica concentrations in the spent fuel pool and uses reverse osmosis as needed to remove lower silica concentrations. Silica has no significant impact on the structural integrity of passive components and is only as a diagnostic parameter in the EPRI *Pressurized Water Reactor Primary Water Chemistry Guidelines*. Additional spent

fuel racks added to the Unit 1 pool in 1998 contain no Boraflex but instead use Boral. Aluminum concentrations in the spent fuel pool water have increased since the introduction of these racks but have not resulted in any significant problems. Ion exchange controls aluminum effectively.

On the secondary side, VEGP has experienced in-leakage (*e.g.*, condenser tube leaks, etc.) from the cooling water side resulting in plant operation at sodium concentrations higher than desirable. In 2002, an inadvertent addition of sodium hexametaphosphate to the condensate chemical feed tanks on both units exceeded the action level 3 limits for sodium in the steam generators (SGs). Both units immediately shut down to reduce the high sodium and phosphate concentrations. Fill and drain processes effectively removed the sodium but significant phosphate residuals remained trapped in the SG by interaction with its internal surfaces and sludge. Small but significant phosphate levels return during start-ups. As a result, the Water Chemistry Control Program modifications included phosphate action levels and terminated molar ratio control. During the last refueling outage for each VEGP unit, chemical cleaning of the secondary side of the SGs removed approximately 7000 pounds of scale deposit from Unit 1 and 5000 from Unit 2. Since the removal of scale deposit and its adsorbed phosphate, the applicant has monitored plant chemistry parameters to determine the best time to re-initiate molar ratio control.

Recent chemistry control improvements replaced the primary and secondary water treatment plants in 2003 with modern treatment components including ultra-filtration, reverse osmosis, catalytic oxygen removal, and final polishing through virgin resin.

The staff focused its review of the “operating experience” program element for this program on the water chemistry operating experience discussed above because this represents that operating experience with potential to impact the integrity of the safety related systems at VEGP.

With regard to the operating experience pertaining to the detection of high sodium and phosphate levels and scale deposits in the secondary sides of the VEGP steam generators, the staff asked the applicant to: (1) clarify whether a root cause analysis of the scale products (corrosion products) was ever performed to identify those chemical elements or compounds that make up the scale, and if so, to identify those elements or compounds that made up the composition of the scale products, and (2) to identify the parameter and process controls that are established to ensure that the concentrations of these adverse elements or compounds are controlled to prevent recurrence of the scale in the SGs.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that the primary source of scale in the steam generators was from metallic oxides, with the predominant species being iron oxide. The applicant stated that the amount of scale is well within the normal range of scale and sludge expected to occur in Westinghouse recirculating steam generators. The applicant also stated that its optimized secondary side water chemistry program is expected to keep the amount of scale in the VEGP steam generators minimized. The applicant supported this basis by confirming that the normal range 0.7 – 0.8 ppb for iron cation concentrations in the secondary side coolant is low (i.e. 0.7 – 0.8 ppb). The staff finds this response to be acceptable because the applicant has taken corrective actions to remove the scale from the VEGP steam generators and because the applicant has supported its basis that its optimized secondary side water chemistry program is achieving its purpose of minimizing metallic cations in the secondary side coolant. This question is resolved.

The staff noted that the applicant's Boral panels in spent fuel pool are composite materials that are made of an aluminum-boron composite material which is housed inside of an encasing aluminum metal sheath. These Boral panels are used for neutron absorbing capability for fuel rods that are contained in the applicant's spent fuel pools. Upon review of this operating experience, the staff was initially concerned that the indications of aluminum in the spent fuel pool could be representative of degradation in either the aluminum sheaths or composite materials in the Boral panels. With regard to this operating experience on detection of aluminum in the borated spent fuel pool coolant, the staff asked the applicant to justify why aluminum levels in the spent fuel pool would not require the applicant to implement a monitoring program for its spent fuel pool Boral panels.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant acknowledged that the source of the aluminum cation concentrations in the VEGP Unit 1 spent fuel pool coolant was from the Boral panels. The applicant identified that the VEGP Unit 2 spent fuel pool does not include Boral panels because criticality coefficient for the VEGP Unit 2 spent fuel pool does not rely on the presence of boron neutron absorbing composite materials (such as Boral or boraflex).

In the applicant's response, the applicant stated that the Boral panels are constructed from aluminum plates which are bonded to aluminum – boron carbide composite material matrix core. The applicant stated that, while it is expected that the aluminum oxide protective layer on the aluminum plates will provide reasonable corrosion resistance, minor release of aluminum into the spent fuel pool coolant over time is an expected phenomenon. The applicant also stated that the aluminum plates (aluminum cladding) in the Boral panels are not credited to prevent loss of aluminum or boron from the aluminum – boron carbide composite material matrix core; the applicant stated that, instead, the aluminum cladding serves the following objectives: (1) acts as a lubricant in the hot rolling process used in fabrication of the Boral panels, and (2) to facilitate handling of the long and narrow panels during handling. The applicant stated that, once the Boral panels are set into place in the fuel pool storage racks, the integrity of the aluminum cladding is not longer of major significance and the aluminum – boron carbide composite material matrix core is considered to be suitable for exposure to the borated water coolant in the spent fuel pool. The applicant further stated that it continues to use its operating experience and corrective actions program to monitor the industry operating experience databases for any Boral degradation issues and that, if relevant Boral degradation operating experience is identified, the operating is assessed for applicability to VEGP and any appropriate corrective action measures are implemented.

However, in LRA Commitment No. 37, dated March 20, 2008, the applicant provided the following commitment relative to Boral panels that are present in the VEGP Unit 1 spent fuel pool in order to ensure that possible degradation of the Boral panels will be is addressed during the period of extended operation:

> To ensure the Boral spent fuel racks will continue to perform their intended function during the period of extended operation, VEGP commits(Appendix A, Commitment Number 37) to monitor spent fuel pool aluminum concentrations and to implement corrective actions if adverse trends are identified. Additionally, SNC will monitor industry experience related to Boral and will take appropriate actions if significant degradation of Boral is identified.

Based on this response, the staff considers that the applicant has addressed that the intended neutron absorbing function of the Boral panels during the period of extended operations because: (1) the applicant has provided a valid basis to support its basis that the aluminum cladding in the panels do not serve a structural integrity function, and (2) the applicant has committed to continued monitoring of the aluminum cation concentrations in the spent fuel pool and to taking appropriate corrective actions if adverse trends in the aluminum cation concentrations are indicated, and (3) the applicant has committed to continued monitoring of the industry operating experience databases for experience related to Boral degradation and to take appropriated corrective actions if significant degradation of Boral is indicated.

Based on this review, the staff concludes that the applicant has adequately addressed the relevant water chemistry operating experience for the VEGP spent fuel pools and steam generator components and has taken steps to ensure that either the relevant conditions do not impose a threat to the intended function of these components or that the applicant has taken applicable steps to address and resolve the adverse conditions created by the operating experience such that the intended functions of the impacted components will be maintained during the period of extended operation. Based on this assessment, the staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.28, the applicant provided the UFSAR supplement for the Water Chemistry Control 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 Water Chemistry Control 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 10 CFR 50 Appendix J Program

<u>Summary of Technical Information in the Application</u> LRA Section B.3.29 describes the existing 10 CFR 50 Appendix J Program as consistent with GALL AMP XI.S4, “10 CFR 50, Appendix J.”

The applicant stated that its 10 CFR 50 Appendix J Program monitors leakage rates through the containment pressure boundary, including penetrations and access openings.

Containment leak rate tests assure that leakage through the primary containment and systems and components penetrating primary containment does not exceed allowable limits of VEGP Technical Specifications. The program takes corrective actions if leakage rates exceed established administrative limits for individual penetrations or for the overall containment pressure boundary. The program also monitors seals, gaskets, and bolted connections.

The applicant also stated that its 10 CFR 50 Appendix J Program utilizes the performance-based approach of 10 CFR Part 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B with appropriate guidance from Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J," and ANSI/American Nuclear Society (ANS) 56.8, "Containment System Leakage Testing Requirements."

Type A tests measure the containment overall integrated leakage rate. Procedures require a general visual inspection of the accessible interior and exterior surfaces of the primary containment and components prior to each integrated leak rate test pressurization and visual examinations of containment, as described in Regulatory Guide 1.163, in the intervals between Type A tests. The next Type A test is scheduled in the year of 2017 for Unit 1 and 2010 for Unit 2 (at a 15-year interval from the previous test).

Type B local leak rate tests on containment pressure boundary access penetrations are at frequencies that comply with the requirements of 10 CFR Part 50 Appendix J Option B. The Type B Test detects or measures leakage across pressure-retaining or leakage-limiting boundaries other than valves.

Type C local leak rate tests on containment isolation valves are at frequencies that comply with the requirements of 10 CFR Part 50 Appendix J Option B.

Staff Evaluation During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report AMP XI.S4.

The staff interviewed the applicant's technical staff and reviewed 10 CFR 50 Appendix J Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.S4. The staff noted that for the integrated leak rate testing, the VEGP program utilizes Option B and the guidance in NRC Regulatory Guide (RG) 1.163 and NEI 94-01, "Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50, Appendix J." For local leak rate testing, the Type B and Type C tests are performed at frequencies that comply with the requirements of 10 CFR 50 , Appendix J, Option B. On the basis of its review, the staff concludes that the applicant's Containment Leak Rate Program provided assurance that the containment leak rate will be adequately managed for the period of extended operations (PEO).

The staff finds the applicant's Containment Leak Rate Program acceptable because it conforms to the recommended GALL AMP XI.S4, "10 CFR 50, Appendix J."

Operating Experience LRA Section B.3.29 states that implementation and maintenance of the 10 CFR 50 Appendix J Program are in accordance with general requirements for engineering programs. Periodic program reviews and assessments ensure compliance with regulatory, process, and procedural requirements.

The applicant stated that the last containment integrated leak rate testing was in March 2002 for Unit 1 (1R10) and in March 1995 for Unit 2 (2R4). Local leak rate testing found some leaks to be repaired prior to the integrated leak rate testing, the results of which were satisfactory and in compliance with the Technical Specifications and 10 CFR Part 50 Appendix J. The applicant noted that following two consecutive leakage rate findings of less than 1.0 (allowable leakage rate), the integrated leak rate testing interval is 15 years, to 1R20 (Spring 2017) for Unit 1 and 2R14 (Spring 2010) for Unit 2, as noted in the program description. In addition, applicant also stated that industry and plant-specific operating experience confirms that the local leak rate tests effectively detect and initiate corrective actions for leakage at containment penetrations, including the equipment hatch and air locks, and confirm the effectiveness of corrective actions taken.

The staff reviewed the above operating experience provided in the LRA and in the operating experience report, and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff noted that there were no instances of Appendix J test failures due to causes other than valve or flange seat leakage. For these failures, all conditions were evaluated and corrected. The staff did not identify any age-related related issues not bounded by the industry operating experience.

On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the staff finds that the applicant's 10 CFR Part 50, Appendix J Program will adequately manage the aging effects for which the AMP is credited

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.29, the applicant provided the UFSAR supplement for the 10 CFR 50 Appendix J 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 10 CFR 50 Appendix J 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 Non-EQ Cables and Connections Program

Summary of Technical Information in the Application LRA Section B.3.34 describes the new Non-EQ 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-EQ Cables and Connections Program maintains the function of electrical cables and connections not subject to 10 CFR 50.49 EQ requirements but exposed to adverse environments of heat, radiation, or moisture significantly more severe than the service condition for the insulated cable or connection.

The aging effect of concern is reduced insulation resistance caused by visually observable (*e.g.*, color changes or surface cracking) degradation of the insulating materials on electrical cables and connections.

The program will inspect visually a representative sample of accessible insulated cables and connections within the scope of license renewal for cable and connection jacket surface anomalies (*e.g.*, embrittlement, discoloration, and cracking). The applicant will provide the technical basis for the sample selections of cables and connections to be inspected. The scope of this sampling program will include electrical cables and connections in adverse environments. The Non-EQ Cables and Connections Program will be implemented and the first inspection will be completed 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 staff reviewed the information in LRA Section B.3.34 that describes the new Non-EQ Cables and Connections Program. The staff interviewed the applicant's technical staff and reviewed Non-EQ Cables and Connections Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.E1.

The staff finds the Non-EQ Cables and Connections Program acceptable because it conforms to the recommended GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR50.49 Environmental Qualification Requirements."

Operating Experience LRA Section B.3.34 states that the new Non-EQ Cables and Connections Program has no programmatic history. Implementation of this program will consider industry and plant-specific operating experience; however, as GALL Report notes, industry operating experience shows adverse environments of heat or radiation for electrical cables and connections next to or above (within three feet of) steam generators, pressurizers, or hot process pipes like feedwater lines.

The program is based on the GALL Report program description, which in turn is based on industry operating experience; therefore, this program when implemented assures management of the effects of aging so applicable components will continue to perform intended functions consistent with the CLB through the period of extended operation.

The staff reviewed the operating experience provided in the program basis document and interviewed the applicant's technical personnel to confirm this program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.

The staff finds that the applicant has considered plant-specific and industry wide operating experience in the development of this program and the applicant has confirmed that the operating experience discussed in GALL AMP XI.E1 is bounding and the operating experience going forward will be captured through the VEGP Corrective Action and Operating Experience Programs implemented in accordance with VEGP procedures.

The staff interviewed the applicant's personnel and reviewed the applicant's Operating Experience Report and a sample of plant-specific operating experience of components in the program and confirmed that the plant-specific operating experience did not identify any aging effects for components within the scope of this program that are not bounded by industry operating 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 will adequately manage the aging effects identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.34, the applicant provided the UFSAR supplement for the Non-EQ Cables and Connections Program. The staff also reviewed the applicant's license renewal commitment list and confirmed that this new program is identified as Commitment No. 25 to be implemented prior to the period of extended operation. 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 Non-EQ Cables and Connections 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Non-EQ Inaccessible Medium-Voltage Cables Program

<u>Summary of Technical Information in the Application</u> LRA Section B.3.35 describes the new Non-EQ Inaccessible Medium-Voltage Cables Program as consistent with GALL AMP XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The new Non-EQ Inaccessible Medium-Voltage Cables Program manages the aging effects for inaccessible medium-voltage cables (cables with operating voltage from 2kV to 35kV) within the scope of license renewal exposed to significant moisture and voltage. The aging effect of concern is localized damage and breakdown of insulation. The program periodically inspects and removes water accumulation from manholes with medium-voltage cables and tests cables as needed. Inspection frequency based on actual plant experience is at least every two years.

In-scope medium-voltage cables exposed to significant moisture and voltage are tested at least every ten years for an indication of the condition of the conductor insulation. The specific test is proven for detecting deterioration of the insulation system due to wetting.

The Non-EQ Inaccessible Medium-Voltage Cables Program will be implemented and the first inspections completed 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 staff reviewed the information in LRA Section B3.35 that describes the new Non-EQ Inaccessible Medium-Voltage Cables Program. During the audit and review , the staff interviewed the applicant's technical staff and reviewed Non-EQ Inaccessible Medium-Voltage Cables Program basis documents. Specifically, the staff reviewed the program elements and associated basis documents to determine consistency with GALL AMP XI.E3.

In addition, the staff reviewed the applicant's evaluations, plant drawings, and cable routings, and also conducted a plant walkdown of the key electrical areas to determine whether the applicant has considered all medium voltage cables within the scope of license renewal in accordance with the guidance provided in GALL AMP XI.E3. The staff verified that the applicant has correctly identified and included cables in the Non-EQ Inaccessible Medium-Voltage Cables Program that meets the following criteria specified in GALL AMP XI.E3: (1) they are located underground and assumed wet, and (2) they must be energized at least 25 percent of the time. VEGP medium voltage cables within the scope of license renewal that did not meet these criteria were screened out and are not included in the Non-EQ Inaccessible Medium-Voltage Cables Program. Based on the review, the staff concludes that the applicant's program basis document appropriately considered the medium-voltage power cables most likely to be exposed to a wetted environment in accordance with GALL AMP XI.E3 recommendations.

Based on the review, the staff finds the applicant's Non-EQ Inaccessible Medium-Voltage Cables Program acceptable because it is consistent with 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.3.35 states that this new program has no programmatic history; however, as the GALL Report notes, operating experience shows that medium-voltage cables simultaneously exposed to significant moisture and significant voltage are susceptible to water tree formation. The formation and growth of water trees vary directly with operating voltage. Treeing is much less prevalent in 4kV cables than in those operated at higher voltages. Minimizing exposure to moisture also minimizes the potential for water tree development.

The applicant states in the LRA that the Non-EQ Inaccessible Medium-Voltage Cables Program is a new program with no site-specific operating experience history. The staff noted that SRP-LR, Revision 1, Appendix A, Branch Technical Position RLSB-1, states that an applicant may have to commit to providing operating experience in the future for new programs to confirm their effectiveness. Therefore, the staff asked the applicant to describe how operating experience will be captured to confirm the program effectiveness and the process to be used to adjust the program as needed. In its response the applicant stated that:

> Industry and plant-specific operating experience will be considered when implementing this program. VEGP has ongoing programs to monitor industry and site operating experience. These programs include mechanisms to update or modify plant procedures or practices to incorporate lessons learned.
>
> Procedures NMP-GM-008, "Operating Experience Program," and 50026-C, "ESD - Operating Experience Program," describe the program for evaluating industry and vendor-supplied operating experience. Operating experience information that is identified as being applicable to VEGP is disseminated to the appropriate groups for further evaluation and possible modification of plant procedures or practices.
>
> If an unacceptable condition or situation is identified in the selected sample, the Corrective Action Program will be used to evaluate the condition and determine appropriate correction action. This corrective action will involve a determination as to whether the same condition or situation is applicable to other cables and connections not in the sample population.
>
> Section B3.35 of the LRA will be revised to indicate that both industry and plant specific OE will be reviewed for this program.

In a letter dated March 20, 2008, the applicant amended the LRA to add the above discussion to the operating experience program element in LRA Section B.3.35.

The staff finds the applicant's response acceptable because the applicant revised the Non-EQ Inaccessible Medium-Voltage Cables Program to state that industry and plant-specific operating experience will be considered in its development. Industry operating experience that forms the basis for the program is included in the operating experience element of the GALL Report program description and the applicant will monitor to verify that plant-specific operating experience is consistent with GALL AMP. In addition, the applicant ‘s existing corrective action and operative experience programs require them to update programs and procedures to incorporate lessons learned.

On the basis of its review of the operating experience program elements and discussions with the applicant’s technical personnel, the staff concludes that the applicant’s Non-EQ Inaccessible Medium-Voltage Cables Program will adequately manage the aging effects for which this AMP is credited.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.35, the applicant provided the UFSAR supplement for the Non-EQ Inaccessible Medium-Voltage Cables Program. The staff reviewed the

applicant's license renewal commitment list dated June 27, 2007, and confirmed that the implementation of the Non-EQ Inaccessible Medium-Voltage Cables Program is identified as Commitment No. 26, to be implemented before the period of extended operation. 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-EQ Inaccessible Medium-Voltage Cables 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Environmental Qualification Program

Summary of Technical Information in the Application LRA Section B.3.37 describes the existing Environmental Qualification Program as consistent with GALL AMP X.E1, "Environmental Qualification (EQ) of Electric Components."

The existing Environmental Qualification Program implements 10 CFR 50.49 requirements. The program demonstrates that certain electrical components are qualified to perform their safety functions in harsh plant environments consistent with 10 CFR 50.49 requirements. The Environmental Qualification Program manages component thermal, radiation, and cyclical aging, as necessary, through the use of aging evaluations. The program requires action be taken before individual components exceed their qualified lives. Actions taken include replacement of parts or components at specified intervals and reanalysis to maintain qualification.

As required by 10 CFR 50.49, EQ components not qualified for the current license term must be refurbished or replaced or their qualification must be extended before they reach the aging limits established in the evaluation. Some aging evaluations for EQ components specify a qualification of at least 40 years and are time-limited aging analyses (TLAAs) for license renewal. The Environmental Qualification Program ensures maintenance of these EQ components within the bounds of their qualification bases.

The reanalysis of an aging evaluation for component qualification under 10 CFR 50.49(e) is a routine part of the Environmental Qualification Program. The reanalysis is normally extends the qualification by reducing conservatisms incorporated in the evaluation. 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. The evaluation may have used conservative bounding conditions that can be refined to extend the qualification.

Important attributes of the reanalysis of an aging evaluation include analytical methods, data collection and reduction methods, the underlying assumptions, the acceptance criteria, and corrective actions (if acceptance criteria are not met).

The analytical models in the reanalysis of an aging evaluation are the same as those of the prior evaluation. The Arrhenius methodology is an acceptable model for a thermal aging evaluation. The analytical method for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (*i.e.*, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method for establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (60 years/40 years) and add the result to the accident radiation dose to obtain the total integrated dose for the component.

For cyclical aging, a similar method may be used. Use of actual plant-specific operating history to re-evaluate and establish the normal integrated radiation dose for the 60-year period may also be used. Other models may be justified case- by-case basis.

Reduction of excess conservatism in the component service conditions (*e.g.*, temperature, radiation, and cycles) used in the prior aging evaluation is frequently employed for a reanalysis. Temperature data used in an aging evaluation is to be conservative based on plant design temperatures or on actual plant temperature data. Actual plant temperature data can be obtained in several ways, including by monitors for compliance with Technical Specifications, other installed monitors, measurements by plant operators during rounds, and temperature sensors on large motors (while not running). Evaluation of a representative number of temperature measurements is conservative to establish the temperatures in an aging evaluation. An aging evaluation may use plant temperature data in different ways: (a) direct application of the plant temperature data in the evaluation or (b) use of the plant temperature data to demonstrate conservatism when using plant design temperatures. Justifications of any changes to material activation energy values in a reanalysis are case-specific. Reduction of excess conservatism in the component service conditions in the prior aging evaluation may use similar methods for radiation and cyclical aging.

EQ component aging evaluations have sufficient conservatism to account for most environmental changes due to plant modifications and events. When unexpected adverse conditions during operational or maintenance activities affect the normal operating environment of a qualified component, the program evaluated the affected EQ component and takes appropriate corrective actions which may include changes to the qualification bases and conclusions.

Reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component is replaced, or re-qualified before it exceeds the period for which the current qualification remains valid. The reanalysis must be timely (*i.e.*, with sufficient time to refurbish, replace, or re-qualify the component if the reanalysis is unsuccessful).

<u>Staff Evaluation</u> During its audit and review, the staff reviewed the applicant’s claim of consistency with the GALL Report.

The staff interviewed the applicant’s technical personnel and reviewed the Environmental Qualification Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP X.E1.

Based on its review, the staff concludes that the applicant's Environmental Qualification Program reasonably assures management of thermal, radiation, and cyclical aging effects for electrical equipment important to safety and located in harsh environments. The staff finds the applicant's Environmental Qualification Program acceptable because it is consistent with the recommended GALL AMP X.E1, "Environmental Qualification (EQ) of Electric Components."

Operating Experience LRA Section B.3.37 states that VEGP has maintained the Environmental Qualification Program since its inception. Program documentation, including EQ packages, is maintained and updated periodically. Routine monitoring of industry operating experience reports, self-assessments, QA audits, and the corrective action process assure continued program improvement and maintenance of VEGP EQ equipment in a qualified condition.

The applicant states in the LRA that an equipment walk-down during the last Environmental Qualification Program Team self-assessment in June 2005 found two EQ Rosemount transmitters with rotated electronic heads indicating possible moisture seal damage or degradation. The team inspected the remaining EQ Rosemount transmitters for rotated heads, replaced eight, and placed warnings about electronic head rotation in the Central File and plant procedure.

A 10 CFR Part 21 notice was recently issued on the potential for Barton transmitters with bare conductors outside their seal plugs or potting compounds. VEGP has addressed this issue by adding a qualified environmental seal for the Barton transmitters.

Data Loggers monitor actual temperatures for many rooms of the plant, finding hot spots resulting in reanalysis and appropriate reductions of component qualified life. The program proposes additional data collection when needed to monitor for temperature changes due to plant changes.

Experienced employees, annual training, industry involvement (Nuclear Utility Group on Equipment Qualification, Nuclear Utility Obsolescence Group, and Institute of Electrical and Electronics Engineers working groups), routine monitoring of OE reports, self-assessments, central file maintenance process improvements, QA audits, and condition reports assure maintenance of EQ equipment in a qualified condition.

The staff interviewed the applicant's technical personnel and also reviewed the above operating experience and the applicant's operating experience reports to confirm that plant-specific operating experience revealed no degradation not bounded by industry experience. A sample review of the applicant' s actions to address EQ related issues related to Part 21 reports, INPO operating experience reports, and periodic self assessments revealed that the applicant is evaluating and addressing the EQ related operating experience issues.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Environmental Qualification Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.37, the applicant provided the UFSAR supplement for the Environmental Qualification 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 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 determined 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 or Enhancements

In LRA Appendix B, the applicant stated that the following AMPs are, or will be, consistent with the GALL Report, with exceptions or enhancements:

- Boric Acid Corrosion Control Program
- Buried Piping and Tanks Inspection Program
- CASS RCS Fitting Evaluation Program
- Closed Cooling Water Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Flow-Accelerated Corrosion Program
- Flux Thimble Tube Inspection Program
- Generic Letter 89-13 Program
- Oil Analysis Program
- One-Time Inspection Program for ASME Class 1 Small Bore Piping
- One-Time Inspection Program for Selective Leaching
- Piping and Duct Internal Inspection Program
- Reactor Vessel Closure Head Stud Program
- Reactor Vessel Surveillance Program
- Steam Generator Tubing Integrity Program
- Structural Monitoring Program
- Structural Monitoring Program - Masonry Walls
- Fatigue Monitoring 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 those attributes or features of the program, for which the applicant claimed consistency with the GALL Report, 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 Boric Acid Corrosion Control Program

Summary of Technical Information in the Application LRA Section B.3.3 describes the existing Boric Acid Corrosion Control Program as consistent, with an enhancement, with GALL AMP XI.M10, “Boric Acid Corrosion.”

The applicant stated that the Boric Acid Corrosion Control Program monitors the condition of components on which borated water may leak to detect, evaluate, and remove borated water leakage and boric acid residue before any loss of intended function of affected components. The program detects boric acid leakage by periodic visual inspection of systems containing borated water and by inspection of adjacent structures and components for evidence of leakage. Development of the program responds to the recommendations of Generic Letter (GL) 88-05. The program addresses operating experience described in recent NRC generic communications, including NRC Regulatory Issue Summary 2003-013.

The program consists of (1) visual inspections of component surfaces potentially exposed to borated water leakage, (2) detection of leak paths and removal of boric acid residue, (3) assessment of the corrosion, and (4) follow-up inspection, as appropriate, for adequacy of corrective actions.

The applicant also stated that enhancements to the Boric Acid Corrosion Control Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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.

During its audit and review, the staff reviewed the elements of the Boric Acid Corrosion Program for which the applicant claims consistency with GALL AMP XI.M10, “Boric Acid Corrosion,” with the enhancement described below.

During the audit and review, the staff reviewed LRA B.3.3, “Boric Acid Corrosion Control Program,” and the program elements defined and discussed in GALL AMP XI.M10, “Boric Acid Corrosion Program.” The staff also reviewed the license renewal evaluation document for the applicant’s Boric Acid Corrosion Control Program and interviewed SNC staff members involved with implementation of the Boric Corrosion Control program.

In Generic Letter (GL) 88-05, “Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants,” the staff informed the U.S. nuclear power industry that borated water leakage is a safety issue for PWR reactor coolant pressure boundaries. In GL 88-05, the NRC recommended that licensees of PWR facilities perform visual examinations of their borated water systems to monitor leakage that could impact the integrity of plant systems made from ferritic steel materials (i.e., carbon steel or low alloy steel materials). The program elements in GALL AMP XI.M10, “Boric Acid Corrosion Program,” are based on performing these leakage examinations, as recommended in GL 88-05.

The applicant, in the program evaluation document, clarifies that the Boric Acid Corrosion Control Program (BACCP) was initially developed in response to NRC Generic Letter 88-05. The program was developed to include the following attributes:

- Determination of the source of the leakage
- Procedures for locating small coolant leakage
- Inspections and assessments to evaluate corrosion impact
- Corrective actions to prevent recurrences

Further, the applicant stated that the current program is also based on NRC Bulletins 2001-01, 2002-02, 2003-02, and NRC Order EA-03-009. The applicant also explained that the scope includes all systems which contain borated water (above 180ºF) and also locations where borated water systems at any temperature may be above carbon steel systems which may be affected by borated water leakage. This procedure states that potential leak locations in concentrated BA systems should be evaluated to determine if potential leakage would impact safety-related equipment (e.g., piping, piping supports, electrical connectors, etc.).

The applicant added that, in conjunction with the Section XI requirements, the following locations are evaluated for examination requirements:

Locations inside containment:

- Reactor Vessel Head
- Mechanical piping connections within the RCPB
- Mechanical piping connections outside of the RCPB
- Alloy 600 base material and Alloy 82/182 weld locations

Locations outside of containment:

- Mechanical piping connections with borated water
- Potential leak locations where potential leakage would impact safety-related equipment
- Mechanical piping connections containing borated water above carbon steel piping systems.

Also, boric acid inspections are implemented through both ISI activities such as leakage testing, leakage assessment, and through normal departmental plant walkdowns.

During the audit and review, the staff asked the applicant to clarify whether the VEGP-specific responses to applicable NRC's generic communications and orders on boric acid leakage or corrosion (including, Bulletin 2003-02, Bulletin 2004-01, and First Revised Order EA-03-009) are within the scope of its Boric Acid Corrosion Control Program.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that the VEGP-specific responses to the applicable NRC's generic communications and orders on boric acid leakage/corrosion are within the scope of the VEGP Boric Acid Corrosion Control Program. This program uses the VEGP reactor coolant system Alloy 600 material inspection program as the current-term program vehicle for performing inspections of these nickel alloy component locations that are the subject of these NRC communications. For the period of extended operation, the Nickel Alloy Program for Reactor Vessel Closure Head Penetrations and the Nickel Alloy Program for Non-Reactor Vessel Closure Head Penetration Locations are the program vehicles for implementing details and commitments.

In addition, the applicant in its response provided references to the Vogtle-specific responses to the following NRC generic communications and orders: NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and reactor Pressure Boundary Integrity," NRC Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at PWRs," and NRC First Revised Order, EA-03-009, "Issuance of First Revised Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors," February 20, 2004.

The staff finds the applicant's response acceptable on the basis that it clearly explained the scope of VEGP Boric Acid Corrosion, which was originally developed in response to GL 88-05, has been modified to include the plant specific responses to the NRC's generic communications and orders.

During the audit and review, the staff asked the applicant to clarify whether any of the commitments made in response to these generic letters and orders are within the scope of the Boric Acid Corrosion Program. The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response provided details regarding commitments that SNC made in response to the following generic letters and orders that are within the scope of the VEGP Boric Acid Corrosion Control Program:

Regarding NRC Bulletin 2003-02, the applicant stated that NRC Bulletin 2003-02 requirements included a one-time visual inspection of all the nozzles penetrating the bottom head of the vessel and a general inspection of the bottom head for indication of wastage or corrosion of the low alloy steel vessel. During the fall 2003 refueling outage for Unit 1 and during the spring 2004 refueling outage for Unit 2, the entire circumference of the interface of each nozzle with the vessel was visually examined for the presence of any deposits that might indicate leakage from the annulus between the nozzle and the vessel bottom head, and no significant problems noted for either Unit.

Regarding NRC Bulletin 2004-01, the applicant stated that the Alloy 82/182 locations at VEGP associated with the pressurizer are the butt welds connecting stainless steel safe ends to one 4" spray nozzle, four 6" Safety/Relief nozzles, and one 14" surge nozzle for each unit. To supplement the Inservice Inspection Program, inspections for the butt welded pressurizer nozzle locations containing Alloy 82/182 material were performed in response to EPRI MRP 2003-039, issued January 20, 2004. Full structural weld overlays mitigation for Alloy 82/182 pressurizer butt welds, consisting of PWSCC-resistant welding material Alloy 52/152, were applied on each of the six pressurizer nozzles on Vogtle Unit 2 during the Spring 2007 refueling outage. On Unit 1, SNC requested approval from the staff (ML073610061) to extend the mitigation actions beyond the December 31, 2007 deadline. VEGP has a commitment (Appendix A, Commitment Number 28) to apply full structural weld overlays during the spring 2008 refueling outage(ML081280889) on Unit 1.

Regarding NRC Order EA-03-009, the applicant stated that VEGP reactor vessel head inspections are performed in accordance with NRC Order EA-03-009 dated February 13, 2003, and revised on February 20, 2004. Order EA-03-009 Section IV.C(5)(a) specifies examination coverage for bare metal visual examination of the reactor vessel head surface. The SNC requested relaxation, relief request, from the staff to not inspect the small surface of the reactor vessel head obscured by insulation. This relief request was granted by the staff in a September 2005 Safety Evaluation. Further, Order EA-03-009 Section IV.C(5)(b) specifies examination volume for reactor vessel head penetration nozzle base material. Full examination volume coverage using ultrasonic testing is not possible at VEGP due to geometric considerations. SNC proposed an alternate to use ultrasonically test nozzle ends to the maximum extent possible. This alternate approach was approved by the staff in an August 2006 Safety Evaluation

The staff finds the applicant's response acceptable on the basis that: 1) regarding Bulletin 2003-02, the entire circumference of the interface of each nozzle with the vessel was visually examined for VEGP Unit 1 and Unit 2, and no significant problems were noted for either unit, 2) regarding NRC Bulletin 2004-01, full structural weld overlays were applied on each of the six pressurizer nozzles on Vogtle Unit 2 during the Spring 2007, and VEGP has a commitment to apply weld overlays during the Spring 2008 refueling outage on Unit 1, and 3) regarding NRC Order, EA-03-009, VEGP reactor vessel head inspections, including one relief and one alternate, are performed in accordance with NRC Order, EA-03-009 dated February 13, 2003 and revised on February 20, 2004.

<u>Enhancement</u>: In the LRA, the applicant states the following enhancement to the GALL Report program elements:

Elements: 1. Program Scope
6. Acceptance Criteria

Enhancement: The Boric Acid Corrosion Control Program scope and acceptance criteria will be enhanced to address the effects of borated water leakage on materials other than steels, including electrical components (e.g., electrical connectors) that are susceptible to boric acid corrosion.

The applicant in Enclosure 2 to its letter dated June 27, 2006 committed (Item 3) to implement the above enhancement prior to the period of the extended operation.

During the audit and review, the staff asked the applicant to list the components that will be added to the scope of this program and materials that they are made of. Also, discuss the method for detection of aging effects, frequency of inspections, and acceptance criteria for evaluation of any detected borated water leakage or crystal buildup for these components.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that SNC has made a commitment (Appendix A, Commitment Number 3) to enhance the Boric Acid Corrosion Control Program to specifically include materials other than steels that are potentially susceptible to boric acid corrosion if exposed to boric acid leakage. Materials identified during the aging management review process other than steels were cast iron, copper alloys, and aluminum alloys. The applicant added that the components subject to an aging management review that are constructed of these materials and have a potential to be exposed to borated water leakage are predominantly fire protection components, misc. mechanical components (e.g., valves, drain bodies, housings, casings) and electrical connectors.

The applicant in its response also stated that detection of aging effects for these components due to borated water leakage or boric acid crystal residue is primarily through visual observation. If a boric acid leak is identified, the applicant will perform a screening evaluation to determine if a corrosion assessment is necessary. If corrosion is present, the applicant's corrective action process assesses the extent of the corrosion, the acceptability of continued service, and any required corrective actions. Boric acid inspections are implemented through ISI activities (e.g., pressure testing), leakage assessments, and personnel performing routine work activities and plant walkdowns (operations, maintenance, health physics, engineering, Boric Acid Corrosion Control Program owner performing program walkdowns, etc.). The frequency of these inspections and activities ensure the timely detection of loss of material due to boric acid leakage.

The staff finds the applicant's response acceptable on the basis that it 1) identified additional components and materials that will be added to the scope of the Boric Acid Corrosion Program and 2) provided clarification that aging effects of the components exposed to boric acid is adequately managed by this program through implementing inservice inspections and other plant's activities.

The staff finds that this enhancement acceptable because the inclusion of mechanical and electrical components made of materials other that steel makes the program consistent with GALL AMP XI.M10.

<u>Operating Experience</u> LRA Section B.3.3 states that an assessment of the Boric Acid Program revealed that it had not detected and evaluated boric acid leaks consistently. Program enhancements based on these findings changed procedures to require personnel to write condition reports of detected boric acid leakage. Problem markers flag leaks outside of containment in the field and boric acid corrosion control training is required for all VEGP site personnel.

Reactor pressure vessel head inspections in accordance with NRC First Revised Order EA-03-009 observed boron residue. There was no evidence of head material wastage or of leaking or cracked nozzles. The boron residue was from previous cleaning and decontamination of conoseals and not new, active leakage. The areas below the conoseals were cleaned and re-inspection during startup observed no leakage.

During the audit and review, the staff requested that the applicant discuss its process for reviewing all VEGP-specific and generic boric acid leakage experience and discuss how this process is used to incorporate such experience into the scope of the Boric Acid Corrosion Control Program and schedule the relevant system locations for boric acid leakage examinations.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that operating experience (OE) is continuously evaluated to determine any impact to aging effects and/or mechanisms managed by the Boric Acid Corrosion Control Program. Plant-specific items such as condition reports, SNC licensee event reports (LERs), SNC OE Alerts are reviewed for potential impact to the Boric Acid Corrosion Program by the program owner. Industry events are likewise screened by the owner for applicability to the Boric Acid Corrosion Program, including NRC generic communications, vendor communications, NUREG reports, industry operating experience, EPRI and MRP reports, and LERs. Health reports are issued periodically on the Boric Acid Corrosion Program, which take into consideration operating experience and trends.

The staff concludes that the operating experience of the Boric Acid Corrosion Program includes the applicant's responses to the NRC's generic communications, applicable NUREG reports, and industry's operating experience and reports applicable to Boric Acid Corrosion Program. On the basis of this determination, the staff finds the applicant's response acceptable.
The staff reviewed the operating experience discussed in program basis document and interviewed the applicant's technical staff and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.3, the applicant provided the UFSAR supplement for the Boric Acid Corrosion Control Program. In Enclosure 2 of its letter dated June 27, 2007, the applicant committed (Appendix A, Commitment Number 3) to enhance Boric Acid Corrosion Control Program documents to address the effects of borated water leakage onto materials other than steels, including electrical components that are susceptible to boric acid operation corrosion. The staff reviewed this commitment and LRA Section A.2.3 and determined 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 Boric Acid Corrosion Control Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent. 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 Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Buried Piping and Tanks Inspection Program

Summary of Technical Information in the Application LRA Section B.3.4 describes the new Buried Piping and Tanks Inspection Program as consistent, with exceptions, with GALL AMP XI.M34, "Buried Piping and Tanks Inspection."

The applicant stated that the Buried Piping and Tanks Inspection Program manages loss of material from the external surfaces of buried carbon steel, cast iron, and stainless steel components by both preventive measures and visual inspections. Preventive measures consist of coatings and wrappings required by design in accordance with industry standards. Buried components within the scope of license renewal will be inspected when excavated for maintenance or exposed for any other reason.

The program applies to the buried components within the scope of license renewal in the following systems:

- Emergency diesel generator system (buried fuel oil storage tanks and fuel oil transfer piping)
- Feedwater system (buried piping between the condensate storage tanks and the condenser hotwells)
- Fire protection system
- Nuclear service cooling water system (buried sample lines between the nuclear service cooling water (NSCW) system pumphouses and the NSCW chemical control buildings)

The applicant also stated that prior to the period of extended operation, a review will determine whether there has been at least one opportunistic or focused inspection of buried piping and tanks within the 10 years prior to the period of extended operation. If not, there will be a focused inspection prior to the period of extended operation.

In addition, there will be a focused inspection of buried piping and tanks within the first 10 years of the period of extended operation unless an engineering evaluation determined that sufficient opportunistic and focused inspections during this time have demonstrated the ability of the underground coatings to protect the underground piping and tanks from degradation.

The Buried Piping and Tanks Inspection Program will be implemented prior to the period of extended operation.

<u>Staff Evaluation</u> During its audit and review, the staff confirmed 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.

During the audit and review, the staff confirmed that preventive measures such as protective coatings/wrappings are used in buried steel, stainless steel, and cast iron piping applications, in addition to buried carbon steel tank applications. The staff verified that as part of the implementation plan for the new program, the VEGP procedure for excavation will be revised to include a requirement that buried piping and tanks are to be inspected when they are excavated for maintenance or when exposed for any reason. In addition, as part of the program implementation, the applicant stated in the program basis document that a new procedure will be issued to provide guidance for inspection of buried piping and tanks which are exposed by excavation. The new procedure will provide the acceptance criteria such that any evidence beyond the acceptance criteria of damaged wrapping or coating defects, such as coating perforation, holidays, or other damage, is an indicator of possible corrosion damage to the external surface of the buried piping and tanks. When inspections reveal evidence of degradation beyond the acceptance criteria, evaluation and appropriate corrective action in accordance with the plant corrective action process may be required.

During audit and review, the staff asked the applicant to identify the methodology and criteria that will be used to determine the locations for inspections based on areas with the highest likelihood of corrosion problems. The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant stated that for focused inspections the determination of areas with the highest likelihood of corrosion problems will include a review of plant condition reports for areas with a history of leaks and corrosion problems or the observance of water or an unusually wet surface on the ground by site personnel while performing normal site activities. The applicant also stated that a review of plant operating experience indicates that this has been the primary method of identifying underground leaks at VEGP. For opportunistic inspections in relatively small excavations, the entire exposed surface will be inspected. For opportunistic inspections in large excavations, the inspections will be performed in the exposed areas with the highest likelihood of corrosion problems, and in areas with a history of corrosion problems (such as near building foundations, at tank nozzles, pipe fittings, locations where the coating system may have been repaired, etc.).

The staff finds the applicant's approach acceptable because for focused inspections the applicant will use historical records to determine areas with the highest likelihood of corrosion problems.

During the audit and review, the staff noted that GALL AMP XI.M34, "Buried Piping and Tanks Inspection" states that gray cast iron, which is included under the definition of steel, is also subject to a loss of material due to selective leaching, which is an aging effect managed under GALL AMP XI.M33, "Selective Leaching of Materials." LRA Section B.3.19 describes the new One-Time Inspection Program for Selective Leaching for VEGP. During the audit and review, the staff asked the applicant to clarify how the One-Time Inspection Program for Selective Leaching will be coordinated with the Buried Piping and Tanks Inspection Program when opportunistic inspections for buried pipe and tanks become available.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated the One-Time Inspection Program for Selective Leaching is credited for managing loss of material due to selective leaching from both the internal and external surfaces of buried gray cast iron fire hydrant components and valve components. The buried cast iron fire protection piping components within the scope of license renewal are not gray cast iron and therefore are not subject to selective leaching.

The VEGP Buried Piping and Tanks Inspection Program implementing procedures will include guidance to notify Engineering Support to have the One-Time Inspection Program for Selective Leaching Program owner review excavations of the fire protection system to determine whether an opportunity exists to perform a selective leaching inspection on a gray cast iron component that is being exposed or replaced. If such an opportunity is determined to exist on a component that can be credited as meeting the requirements of the One-Time Inspection Program for Selective Leaching, it will be the option of the responsible site personnel to perform a selective leaching inspection. Once the requirements of the One-Time Inspection Program for Selective Leaching are fulfilled, no further selective leaching inspections would be performed under that program.

The staff finds the applicant's response acceptable because it explained the details of how the VEGP Buried Piping and Tanks Inspection Program and One-Time Inspection Program for Selective Leaching Program will coordinate inspections during buried component excavations.

The staff reviewed those portions of the Buried Piping and Tanks Inspection Program for which the applicant claims consistency with GALL AMP XI.M34 and found that they are consistent with the GALL Report AMP. Furthermore, the staff concludes that the applicant's Buried Piping and Tanks Inspection Program will properly manage the aging of buried piping and tanks for the period of extended operation. The staff finds the applicant's Buried Piping and Tanks Inspection Program acceptable because it conforms to the recommended GALL AMP XI.M34, "Buried Piping and Tanks Inspection Program," with the exception as described below.

The LRA states an exception to the following GALL Report program elements:

Elements: 1: scope of the program
3: parameters monitored or inspected
10: operating experience

Exception: The VEGP Buried Piping and Tanks Inspection Program contains an exception to the scope of the GALL program in that the VEGP program addresses buried stainless steel piping in addition to buried steel piping and tanks.

During the audit and review, the staff noted that the applicant stated in the program basis document that the addition of stainless steel leads to the conclusion that there is a potential for galvanic corrosion of carbon steel if any dissimilar metal joints exist in the buried environment.

The staff finds the exception acceptable because it includes the inspection of buried stainless steel piping within the scope of the program and while stainless steel buried piping is not likely to experience the same aging effects as buried steel piping there is a potential for galvanic corrosion of the carbon steel piping if any dissimilar metal joints exist in the buried environment. Since the applicant believes there is the possibility that buried stainless steel pipe may be connected to steel piping at dissimilar metal joints; the staff agrees that it is appropriate to include stainless steel pipe within the scope of the program, inspect a sampling of stainless steel buried piping at dissimilar metal joints and review operating experience for buried stainless steel pipe connected to buried steel pipe.

Operating Experience LRA Section B.3.4 states that this new program has no documented programmatic operating experience. There have been failures in buried galvanized pipe not within the scope of license renewal. The only leaks from buried components within the scope of license renewal were in buried fire protection components typically attributed to design, installation, or operational and not age-related issues.

The program is based on the GALL Report program description which in turn is based on industry operating experience. This industry experience-basis for the program assures that implementation of the Buried Piping and Tanks Inspection Program will manage the effects of aging adequately during the period of extended operation.

The staff noted in LRA Section B.3.4, Buried Piping and Tanks Inspection Program, under the program element “operating experience,” that the only leaks identified from buried components within the scope of license renewal were in buried fire protection components. These leaks were typically attributed to design, installation, or operational issues, and not age related. During the audit and review, the staff asked the applicant to quantify the number of leaks identified in the buried fire protection system and identify the type of components affected and also discuss the number of leaks attributed to design, installation, or operational issues and the number of leaks attributed to age-related degradation and characterize the root causes of the leaking fire protection components. In addition, the staff asked the applicant to clarify if any of the leaks have resulted from age-related aging, and to provide the basis for not crediting a periodic inspection-based program to manage the effects of aging on the intended functions of the impacted buried fire protection components for the period of extended operation.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that from 1999 through 2006, eight leaks were identified in fire protection system buried piping, including:

- two installation errors (bolt left out of a pipe flange, pipe sections misaligned)
- one pipe damaged during excavation of an adjacent storm drain
- one leaking gasket at pipe elbow
- one pipe break due to a water hammer event
- three leaks with no cause documented.

In addition, the applicant stated one leak has been identified but has not yet been excavated, so neither the source of the leak or its cause has been determined. This leak is noted here because sampling of water from the leak indicates that it could be from fire protection.

A Root Cause and Corrective Action (RCCA) determination is documented for the condition report addressing the water hammer event. That condition report describes a fire protection pipe break due to a water hammer event. The apparent causes of this event were identified as unusual plant conditions or configuration (fire protection surveillance in progress) and equipment not designed for the operating conditions (modification created an extended dead leg of buried piping susceptible to water hammer). An RCCA determination is not documented for the remaining fire protection leaks.

The applicant did not identify leaks that were attributed to age-related degradation. In addition, the applicant stated inspections done on pipe segments replaced in 1999, 2003 and 2004 (documented in VEGP condition reports) did not identify either internal or external corrosion. Therefore a periodic inspection-based program is not warranted.

The staff finds the applicant’s response acceptable because the leaks identified were not attributed to age-related degradation. The VEGP specific operating experience demonstrates that VEGP has not experienced age-related degradation of its buried piping and tanks within the scope of license renewal and subject to aging management. While there have been leaks associated with the VEGP buried piping and tanks, they have been the result of design, operation and construction issues. VEGP will continue to document issues with buried piping and tanks up to the period of extended operation and review the information when determining if enough opportunistic buried piping and tank inspections have been performed or use the information to determine where to perform focused buried pipe and tank inspections within the 10 years prior to the period of extended operation.

During the audit and review, the staff reviewed the actual operating experience documentation referenced in the basis document for the Buried Piping and Tanks Inspection Program and did not find any unusual or significant findings associated with age-related degradation.

On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Buried Piping and Tanks Inspection Program, when implemented, will adequately manage the aging effects for which the AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.4, the applicant provided the UFSAR supplement for the Buried Piping and Tanks Inspection Program. The staff reviewed the applicant's license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that this program is identified as Commitment No. 4 to be implemented before the period of extended operation. The staff reviewed LRA Section A.2.4 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 Buried Piping and Tanks Inspection Program, the staff finds, with the implementation of Commitment No. 4, that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and its 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 CASS RCS Fitting Evaluation Program

Summary of Technical Information in the Application LRA Section B.3.5 describes the new CASS RCS Fitting Evaluation Program as consistent, with exception, with GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)."

The CASS RCS Fitting Evaluation Program manages the effects of loss of fracture toughness due to thermal aging for susceptible CASS components in the reactor coolant system (RCS). This program augments Inservice Inspection Program requirements.

The applicant stated that this AMP evaluated the susceptibility of CASS components to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. Screening for susceptibility to thermal aging is not required for pump casings and valve bodies according to the assessment documented in the letter dated May 19, 2000, from Christopher Grimes, NRC, to Douglas Walters, NEI. ASME Code Section XI inspection requirements, including the alternative requirements of ASME Code Case N-481 for pump casings, are adequate for all pump casings and valve bodies.

The program manages aging through either a flaw tolerance or an enhanced volumetric examination. Additional inspections or evaluations to demonstrate the adequacy of the material's fracture toughness are not required for components which are not susceptible to thermal aging embrittlement.

According to the applicant, based on screening consistent with the process specified in GALL Report Revision 1, Section XI.M12, VEGP components requiring additional aging management under this program are the Unit 1 Loop 4 and the Unit 2 Loop 1 reactor coolant pump inlet elbows. For these two castings, management of loss of fracture toughness due to thermal aging will be by component-specific flaw tolerance evaluation, additional inspections, or a combination of these techniques.

The applicant also stated that this program will not include the CASS bottom-mounted instrumentation column cruciforms, reactor vessel internals components managed by the Reactor Vessel Internals Program.

The applicant noted that the CASS RCS Fitting Evaluation Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed the applicant's claim of consistency, with an exception, 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.

During its audit and review, the staff reviewed the program elements of LRA B.3.5, "CASS RCS Fitting Evaluation Program," for which the applicant claims consistency with GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," with the exception described below.

During the audit and review, the staff also reviewed the license renewal evaluation document for the applicant's CASS RCS Fitting Evaluation Program and interviewed SNC staff members involved with implementation of the CASS RCS Fitting Evaluation Program.

GALL XI.M12, Scope of Program states that the program includes screening criteria to determine which CASS components are potentially susceptible to thermal aging embrittlement and require augmented inspection. The screening criteria are applicable to all primary pressure boundary and reactor vessel internal components constructed from SA-351 Grades CF3, CF3A, CF8, CF8A, CF3M, CF3MA, CF8M, with service conditions above 250°C (482°F).

The screening criteria for susceptibility to thermal aging embrittlement are not applicable to niobium-containing steels; such steels require evaluation on a case-by-case basis.

During the audit and review, the staff noted that the applicant, in the program evaluation document clarifies that none of the VEGP CASS components are niobium-containing steels. As such, the staff concludes that the limitation on use of the normal screening criteria for niobium containing steels is not applicable to VEGP.

GALL XI.M12, Scope of Program states that based on the criteria set forth in the Christopher Grimes letter dated May 19, 2000, the susceptibility to thermal aging embrittlement of CASS components is determined in terms of casting method, molybdenum content, and ferrite content. For low-molybdenum content (0.5 wt.% max.) steels, only static-cast steels with >20% ferrite are potentially susceptible to thermal embrittlement. Static-cast low-molybdenum steels with ≤20% ferrite and all centrifugal-cast low-molybdenum steels are not susceptible. For high-molybdenum content (2.0 to 3.0 wt.%) steels, static-cast steels with >14% ferrite and centrifugal-cast steels with >20% ferrite are potentially susceptible to thermal embrittlement. Static-cast high-molybdenum steels with ≤14% ferrite and centrifugal-cast high-molybdenum steels with ≤20% ferrite are not susceptible.

During the audit and review, the staff requested that the applicant identify all CASS components that have been screened out from AMP B.3.5 based on the above screening criteria and to provide the bases (including relevant casting method information and Molybdenum and delta-ferrite content parameter value information) for excluding these components from the scope of the AMP.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that reactor coolant loop pipe castings are centrifugally cast from CF8A (low Molybdenum) material. Using the criteria contained in the May 19, 2000 letter from Christopher Grimes to Douglas Walters, none of these castings are susceptible to significant thermal embrittlement, regardless of the casting Mo and delta Ferrite content. The VEGP reactor coolant loop elbow fitting castings, which are statically cast from CF8A (low Mo) material, have been screened out from AMP B.3.5 using casting data, based on the screening criteria in the Christopher Grimes letter dated, May 19, 2000. However, the VEGP Unit 1 Loop 4 RCP inlet elbow and the VEGP Unit 2 Loop 1 RCP inlet elbow are considered to be potentially susceptible to thermal embrittlement aging using their casting data. The applicant also noted that the Mo content values for the component with static casting were assumed at the max allowed by SA351 Grade CF8A in the absence of measured Mo content.

The applicant also in its response provided the results of the SNC calculations for the VEGP reactor coolant loop piping, loop fittings, and accumulator injection line laterals. As a result of these analyses, the applicant determined the VEGP components that require additional aging management under this program are the VEGP Unit 1 Loop 4 RCP inlet elbow and the VEGP Unit 2 Loop 1 reactor coolant pump (RCP) inlet elbow.

During the audit and review, the staff reviewed the CASS RCS Fitting Evaluation Program and the supporting documents. The staff also reviewed the ferrite content calculation method used for screening. On the basis of its review, the staff has determined that the applicant has applied the NRC's screening criteria (i.e. criteria in the Christopher Grimes letter of May 19, 2000) to establish those RCS CASS piping components that are susceptible to thermal aging because the applicant has credited either inspection methods or analysis methods to manage thermal aging embrittlement and the staff concludes the applicant's response to the staff's question is acceptable. Therefore, the staff finds LRA B.3.5, with the exception described below, consistent with the GALL AMP XI.M12.

Exception In the LRA Section B.3.5, the applicant identified an exception to the following GALL Report program elements:

Elements	5: Monitoring and Trending 6: Acceptance Criteria
Exception:	Flaw tolerance evaluations and any inspections will be performed in accordance with the VEGP Inservice Inspection Program Code of Record at the time of the evaluation.

GALL Report Section XI.M12, describes the program as conforming to the requirements of the ASME Code, Section XI, 2001 Edition including the 2002 and 2003 Addenda, for flaw tolerance evaluation and inspections. The staff noted that for the current inspection interval, the VEGP Inservice Inspection Program, which is augmented to detect the effects of loss of fracture toughness due to thermal brittlement, uses ASME Section XI, 2001 Edition including the 2002 and 2003 Addenda. The staff concludes that this is not an exception to the GALL Report recommendations.

During the audit and review, the staff asked the applicant to explain why the relevant statement on the Code Edition for the LRA B.3.5 is considered to be an exception to GALL AMP XI.M12, or clarify if the LRA needs to be amended to delete this exception based on the staff's determination.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that SNC understands it is the staff's interpretation that use of later Editions of ASME Section XI than the edition specified in the GALL Report, Revision 1 for future inspection intervals is not an exception to the GALL Report, provided the Edition of ASME Section XI currently used is the same Edition referenced in the GALL Report, Revision 1. As a result, the applicant in its letter dated March 20, 2008 amended the "Exceptions to NUREG-1801" section of B.3.5 to read "None" for the exception for this program. In addition, the applicant amended the "Program Description" text for section B.3.5 to add the removed "Exception" text, along with the content of footnote (1) from the LRA. The staff finds the applicant's response and the revision to LRA B.3.5 program consistent with the GALL AMP XI.M12 recommendation. The staff reviewed the amendment letter and verified that the applicant made the changes.

Operating Experience LRA Section B.3.5 states that the new CASS RCS Fitting Evaluation Program has no operating experience.

To date, there has been no plant-specific or industry operating experience with degradation of austenitic stainless steel castings due to thermal aging.

The screening criteria in use by the GALL Report and by the VEGP RCS CASS Fitting Evaluation are based upon research data in NUREG/CR-4513, Revision 1. Flaw tolerance evaluation criteria are conservative based on Section XI of the ASME Boiler & Pressure Vessel Code. Because the ASME Code is a consensus document widely used over a long period, it has been effective in managing aging effects in components and their attachments in light-water cooled power plants.

The staff noted that the CASS Evaluation Program is a new program for which no programmatic operating experience exists. There has been no VEGP or industry field operating experience regarding degradation of austenitic stainless steel castings due to thermal aging. However, laboratory data clearly demonstrates that reductions in material fracture toughness occur in cast austenitic stainless steels when operated at elevated temperatures; however, this effect has yet to be observed in an operating PWR.

During the audit and review, the staff recognized that VEGP has ongoing programs to monitor industry and site operating experience. These programs include mechanisms to update or modify plant procedures or practices to incorporate lessons learned. The VEGP operating experience procedures describes the program for evaluating industry and vendor-supplied operating experience and possible modification of plant procedures or practices. On this basis, the staff finds it acceptable that the future plant specific and industry operating experience relevant to the CASS Evaluation Program will be captured by the plant operating experience procedures.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; the staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.5, the applicant provided the UFSAR supplement for the CASS RCS Fitting Evaluation Program. In Enclosure 2 of its letter dated June 27, 2007, the applicant committed (Item No. 5) to implement, the CASS RCS Fitting Evaluation Program described in LRA Section B.3.5, prior to the period of extended operation. The staff reviewed this section and determined 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 CASS RCS Fitting Evaluation Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Closed Cooling Water Program

Summary of Technical Information in the Application LRA Section B.3.6 describes the existing Closed Cooling Water Program as consistent, with exceptions and an enhancement, with GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

The applicant stated that the Closed Cooling Water Program manages loss of material, cracking, and reduction in heat transfer in closed-cycle cooling water systems and components cooled by these systems.

The program maintains corrosion inhibitor, pH-buffering agent, and biocide concentrations, monitors concentrations of detrimental ionic species, reduces them if necessary and monitors and evaluated important diagnostic parameters for significant trends. The program also trends iron and copper concentrations, inspects components, and monitors corrosion rates.

The applicant also stated that the Closed Cooling Water Program is based on the EPRI closed cooling water chemistry guidelines, currently "*Closed Cooling Water Chemistry Guideline: Revision 1 to TR-107396, Closed Cooling Water Chemistry Guideline*, EPRI, Palo Alto, CA: 2004. 1007820." Closed Cooling Water Program updates follow releases of EPRI guideline revisions.

The applicant stated that Closed Cooling Water Program enhancements will be implemented prior to the period of extended operation.

<u>Staff Evaluation</u> During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and an enhancement 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 the information in AMP B.3.6, "Closed Cooling Water Program," the license renewal (LR) basis evaluation document, and the applicant's VEGP-specific procedures that pertain to the design, details, and implementation of this AMP.

The staff concludes that the applicant identifies that the Closed Cooling Water Program is an existing AMP that is designed to be consistent with the program elements in GALL AMP XI.M21, "Closed Cooling Water System," with exceptions and an enhancement. Specifically, the staff reviewed those portions of the AMP program elements for which the applicant claims consistency with GALL AMP XI.M21.

The staff concludes from its review of the LR basis evaluation document that the program elements for the Closed Cooling Water Program are consistent with the program elements in GALL AMP XI.M21 with the following two exceptions taken to GALL AMP XI.M21, and one enhancement of the program. The staff's evaluation on how these exceptions and the enhancement provide for adequate aging management is described in the paragraphs that follow:

<u>Exceptions</u>

Exception 1: The LRA states an exception to the "preventive actions" program element in GALL AMP XI.M21, "Closed Cooling Water Program." Specifically, the exception states:

> The VEGP program currently uses the 2004 version of the EPRI Closed Cooling Water Chemistry Guidelines (EPRI 1007820) and will be updated periodically to incorporate later closed cooling water guidance. The program described in NUREG-1801, Section XI.M21, is based on the 1997 version of the EPRI Closed Cooling Water Chemistry Guidelines, TR-107396. The VEGP program currently uses the 2004 version of the EPRI Closed Cooling Water Chemistry

> Guidelines and will be updated periodically to incorporate later closed cooling water guidance. This difference is considered to be an exception.

The staff asked the applicant to clarify how EPRI Report No.1007820 differs from EPRI Report No.107396 in its recommendations for preventive actions program element, and provide the basis why the preventive actions described in EPRI 1007820 are considered acceptable for managing corrosion and stress corrosion cracking in the closed-cycle cooling water systems.

In its response, dated February 8, 2008, the applicant stated that:

> EPRI 1007820, "Closed Cycle Cooling Water Chemistry Guideline," Revision 1, supersedes EPRI TR-107396, "Closed Cycle Cooling Water Chemistry Guideline," Revision 0. Revision 1 includes normal ranges for chemistry control parameters, extends allowable corrosion inhibitor concentrations, and establishes well defined action levels.
>
> All VEGP closed-cycle cooling water systems included within the scope of license renewal currently use nitrite / azole based corrosion control. For a nitrite based program, the differences between the Revision 0 and Revision 1 are summarily described as follows:
>
> Revision 1 revises the Nitrite, Azole, pH, Chloride, Fluoride, dissolved oxygen control range, it also specifies monitoring frequencies for Tier 1, Tier 2, and Intermittent Systems
>
> Revision 1 of the EPRI Closed Cooling Water Guidelines provides an acceptable basis for managing corrosion and SCC in closed cooling water system, Revision 1 is a considerably more prescriptive guideline, which results in an improved application of chemistry controls.

The staff noted that GALL.AMP XI.M21 recommends that the program include (a) preventive measures to minimize corrosion and stress corrosion cracking (SCC) and (b) testing and inspection to monitor the effects of corrosion and SCC on the intended function of the component. The GALL AMP XI.M21 also relies on maintenance of system corrosion inhibitor concentrations within the specified limits of Electric Power Research Institute (EPRI) TR-107396 to minimize corrosion and SCC, non-chemistry monitoring techniques such as testing and inspection in accordance with guidance in EPRI TR-107396 for closed-cycle cooling water (CCCW) systems provide one acceptable method to evaluate system and component performance. These measures, recommended by GALL AMP XI.M21, will ensure that the intended functions of the CCCW system and components serviced by the CCCW system are not compromised by aging.

The staff reviewed the applicant's evaluation and confirmed that the applicant had incorporated EPRI TR-1007820 as the technical basis guideline for the Water Chemistry Control – Closed Cooling Water Program. The staff concludes that the use of EPRI TR-1007820 provides guidance consistent with the recommendations in GALL AMP XI.M21 and offers more detail on the various water treatment methods used at nuclear power plants, as well as control and diagnostic parameters, monitoring frequencies, operating ranges, and action levels.

Therefore, the staff finds the use of EPRI TR-1007820 as the basis for this program acceptable.

On this basis, the staff concludes that the use of EPRI Report No. TR-1007820 is an acceptable alternative industry guideline for the Closed Cycle Cooling Water Systems and will continue to provide adequate aging management guidelines of Closed Cycle Cooling Water Systems and components that are within the scope of the program.

Based on the above assessment and staff evaluation, the staff concludes that this exception to the “preventive actions program element” in GALL AMP XI.M21 is acceptable.

Exception 2: The LRA states an exception to the “parameters monitored/inspected,” “detection of aging effects,” “monitoring and trending,” and “acceptance criteria, “ program elements in GALL AMP XI.M21,”Closed- Cycle Cooling Water System.”

Specifically, the exception states:

> The VEGP program is based on EPRI 1007820, which does not include performance monitoring and functional testing. The VEGP program uses corrosion monitoring techniques to manage component degradation that could impact a passive function. **
>
> **This exception includes the following footnote
>
> The program described in NUREG-1801, Section XI.M21, describes performance testing and functional testing as performed in accordance with EPRI TR-107396. The VEGP program is based on EPRI 1007820, which does not include performance monitoring and functional testing as a key part of a closed cooling water program. EPRI 1007820 notes that performance testing is typically part of an engineering program. In most cases, functional and performance testing verify that component active functions can be accomplished and as such would be included as a part of Maintenance Rule (10 CFR 50.65). Therefore, performance monitoring and functional testing is not included as a part of the VEGP Closed Cooling Water Program. The VEGP program uses corrosion-monitoring (which includes component inspections) to monitor program effectiveness at managing component degradation that could impact a passive function.

The staff asked the applicant to identify the corrosion monitoring techniques that will be applied as part of this exception and to provide its basis for concluding that corrosion monitoring alone is considered to be capable of managing aging for the period of extended operation without crediting any performance or functional tests, as is otherwise recommended in “GALL AMP XI.M21”Closed- Cycle Cooling Water System.”

In its response, dated February 8, 2008, the applicant stated that:

> Corrosion monitoring aspects of the SNC Closed Cooling Water Program implemented to-date include monitoring and trending iron and copper concentrations and limited corrosion coupon measurements.

Measurement of accumulated corrosion products such as iron and copper provides an indirect indication of system corrosion. Each system establishes normal concentrations of these corrosion products. Consequently, a specific not to exceed value cannot be assigned. Rather, it is the overall trends which provide meaningful information regarding system corrosion rates. Corrosion coupons are installed in the VEGP Turbine Plant Cooling Water System. Measurement of coupon weight loss is an effective means to assess corrosion rates.

As summarized in the enhancement subsection of LRA Section B.3.6, additional corrosion monitoring techniques will be implemented prior to the period of extended operation. Currently, the monitoring techniques being considered include electrochemical monitoring, such as linear polarization measurement or electrochemical noise corrosion rate monitoring, and corrosion inspections.

Electrochemical monitoring techniques, corrosion inspection techniques, primarily in the form of visual inspections are important parts of the inspection process. Inspection techniques will vary depending on the component type being inspected (piping, valves, heat exchangers, pump casings, etc.).

While NUREG-1801 Section XI.M21 endorses performance and functional testing with EPRI TR-107396 as a basis, neither EPRI TR-107396, nor EPRI 1007820 conclude that performance or functional testing are effective for detection of passive component aging effects. However, both EPRI documents also recognize that performance monitoring is typically part of an engineering program. In most cases, functional and performance testing verifies that component active functions can be accomplished and such would be governed by the maintenance rule (10 CFR 50.65). For example, corrosion cannot be detected by system performance testing.

Therefore, performance monitoring and functional testing is not included as a part of the VEGP Closed Cooling Water Program. The VEGP program uses corrosion-monitoring (which includes component inspections) to monitor program effectiveness at managing component degradation that could impact a passive function.

The staff noted that while GALL AMP XI.M21 endorses performance and functional testing with EPRI TR-107396 as a basis, neither EPRI TR-107396 nor EPRI 1007820 determined that performance or functional testing are effective for detection of passive component aging effects.

Also, the staff noted that VEGP program uses corrosion-monitoring, that will be implemented prior to the period of extended operation and, also the functional testing is done as per the maintenance rule.

The staff reviewed EPRI Report TR-1 007820 (Revision 1 to EPRI TR-1 07396) and determined that it does not recommend that performance and functional testing be part of the water chemistry control program. This engineering testing could be performed as part of another program. Usually, the Maintenance Rule (10 CFR 50.65) dictates the requirements of the performance and functional testing, although Technical Specification (TS) 3.7 does mandate some performance/functional testing for the Vogtle component cooling water (CCW) system. The staff also noted that the applicant does sample and test corrosion coupons in the Turbine Plant Cooling Water System (TPCW) to monitor the effects of corrosion on the system and that the applicant indicated that it may use electrochemical potential monitoring techniques as additional potential monitoring techniques for the components that are within the scope of this program. The staff finds that these measures will provide for an adequate means of managing corrosion in the CCCW systems because the applicant does inspect the components (condition monitoring) for corrosion and because the applicant does actually perform some performance/functional testing to manage corrosion that may potentially occur in the CCCW systems (i.e. required performance/functional testing of the CCW system components). Therefore, the staff finds that the activities included in this program are adequate to manage the aging effects for which the program is credited without the need for performance and functional testing. On this basis, the staff finds this exception acceptable.

This exception is acceptable, because, the staff concludes that this exception to the "parameters monitored/inspected," "detection of aging effects," monitoring and trending," and "acceptance criteria," program elements is adequate to manage the aging effects for which it is credited. The exception, therefore, is acceptable.

Enhancement: The LRA states an enhancement to the "parameters monitored/inspected program element in GALL AMP XI.M21, "Closed Cooling Water Program" Specifically, the enhancement states:

> The VEGP Closed Cooling Water Program Strategic Plan will be updated to indicate the components in each system that are most susceptible to various corrosion mechanisms and to ensure that corrosion monitoring is appropriately implemented.

During the audit, the staff asked the applicant to clarify how a ranking of the in-scope components would be accomplished based on the susceptibility to corrosion mechanisms and clarify how the susceptibility ranking will be applied to the AMP in order to pick components for inspection.

In its response, dated February 8, 2008, the applicant stated that:

> A reasonable assessment of system components most susceptible to corrosion can be developed using a fundamental understanding of corrosion principles associated with closed cooling water chemistries and review of system, plant, and industry operating experience.
>
> Components located in stagnant regions or in systems that are infrequently operated and components with creviced regions are at greater risk for significant corrosion since adequate transport of corrosion inhibitors, pH buffering agents, and biocides to the component location may not occur and adequate transport of corrosion products away from the component may not occur. In these cases, inadequate corrosion film development, deposit

formation, and increased microbiological activity could result in increased corrosion rates not consistent with observed corrosion rates for other portions of the system. Additionally, creviced areas could experience differential aeration, resulting in localized attack of material within the crevice.

Components located in higher temperature regions could experience higher corrosion rates due to the fundamental temperature dependence on corrosion rates.

Review of system and plant operating experience provides a valuable tool for use in estimating component locations most likely to be more susceptible to degradation mechanisms.

Finally, reviews of industry-wide operating experience, including chemistry history, inspection results, and repair histories, can provide valuable insights into the corrosion processes occurring within closed cooling water systems and can be incorporated into susceptibility evaluations for these systems.

Based on this response, SNC will enhance VEGP License Renewal future action commitment list Item no. 6 as follows:

Enhance Closed Cooling Water Program documents to indicate the components in each system that are most susceptible to various corrosion mechanisms and to ensure that corrosion monitoring is appropriately accomplished. This qualitative assessment will be based on an understanding of corrosion principles associated with closed cooling water chemistries and on review of system, plant, and industry operating experience. Parameters considered in the review will include system flow parameters (focusing on identification of stagnant regions and on intermittently operated systems), normal operating temperatures, and component geometries (e.g. creviced areas).

The applicant's CCW is a CCCW system and is within the scope of the limiting conditions for operation in Technical Specification (TS) 3.7. The staff verified that TS 3.7 does require the applicant to perform verification of CCW flow once every 18 months. The staff noted that the applicant response indicates that corrosion monitoring (inspections) will be performed on those components in each system that are considered to be most susceptible, as based on plant, system and industry-wide operating experience with corrosion and on the utilization of the fundamentals of corrosion principles to various corrosion mechanisms. The staff considers this question to be resolved because the applicant will use appropriate industry and engineering bases to select for inspection those CCCW components that are considered most susceptible to corrosion and because the applicant does perform some functional/performance testing on the CCW system in accordance with Vogtle TS. The staff also verified that the applicant amended the LRA in a letter dated March 20, 2008, and in this letter the applicant provided its updated version of LRA Commitment No.6 as discussed above.

Based on this review, the staff finds that the applicant's enhancement of the program, as described in Commitment No.6, in acceptable for aging management because the applicant will inspect those components that are identified as being most susceptible to corrosion and because the applicant does perform some functional testing of the CCW system in accordance with Vogtle TS. Based on this review, staff concludes that the enhancement of the "parameters monitored/inspected" program element, as described in LRA Commitment No. 6, will make VEGP AMP B.3.6, consistent with GALL AMP XI.M21, " Closed Cooling Water Program," and that this enhancement of the program will provide additional assurance that the effects of aging will be adequately managed.

Operating Experience LRA Section B.3.6 states that the Closed Cooling Water Program is based on EPRI guidelines based on plant experience, research data, and expert opinion periodically updates and improves these guidelines.

The staff noted that the applicant did identify some issues regarding nitrite intrusions in some of its CCCW systems. The staff verified that the applicant had resolved most of the issues with nitrite intrusions by implementing feed and bleed operations which r the nitrite concentrations back to acceptable values.

The staff noted however, that applicant did identify some issues regarding to date, the SCC-induced leakage (caused by nitrite intrusion) has been limited to the VEGP Unit 2 ACCW system. The staff noted that the applicant developed, credits, and implements its ACCW Carbon Steel Components Program solely for the purpose of managing SCC induced cracking of the VEGP Unit 2 ACCW system. The staff evaluated the ability of this program to manage SCC-induced cracking of the VEGP Unit 2 ACCW system in SER Section 3.0.3.3.1 Based on this review, the staff finds that the applicant has adequately resolved the issues regarding nitrite intrusion in the CCCW systems. adverse trends with respect to iron and copper concentrations in the CCCW systems.

The staff also noted that the applicant did identify some degradation of the composite polymer (Ceram Alloy) coatings in the emergency diesel generator system lube oil heat exchangers, and in particular minor blistering and flaking of the coating system without any significant deterioration of the underlying base metals. The staff verified, however, that VEGP is removing the Ceram Alloy coatings and that the applicant does not take any license renewal credit coatings. Thus, the staff finds that this OE does not impact the ability of the Closed Cooling Water System Program to manage the effects of corrosion in those CCCW components that are exposed to the treated water environments of the CCCW systems.

Based on the aforementioned verification by staff, the staff concludes that the "operating experience" program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.10

UFSAR Supplement

The staff reviewed the UFSAR Supplement summary description that was provided in LRA Section A.2.6 for the Closed Cooling Water Program. The staff verified that, in LRA Commitment No. 6 in the applicant's response letter dated March 20, 2008plicant committed to enhance the program and associated documents to indicate the most susceptible components for corrosion and to implement the Closed Cooling Water Program prior to the period of extended operation. The staff also verified that the applicant has placed this commitment on UFSAR Supplement summary description A.2.6 for Closed Cooling Water Program.

Based on this review, the staff finds that UFSAR Supplement Section A.2.6 provides an acceptable UFSAR Supplement summary description of the applicant's Closed Cooling Water Program, when enhanced will manage loss of material, cracking and reduction of heat transfer in the closed-cycle cooling water systems and any components cooled by these systems and will be implemented as committed to in LRA Commitment No. 6 because it is consistent with those UFSAR Supplement summary description in the SRP-LR for the Closed Cycle Cooling Water System. Therefore, the staff concludes that the UFSAR supplement for this AMP provides an adequate summary description of the program, as described by 10 CFR 54.21(d).

Conclusion On the basis of its audit and review of the applicant's Closed Cooling Water Program, the staff concludes 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. 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 Report 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 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 also reviewed the UFSAR supplement for this AMP and determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 External Surfaces Monitoring Program

Summary of Technical Information in the Application LRA Section B.3.8 describes the new External Surfaces Monitoring Program as consistent, with exceptions, with GALL AMP XI.M36, "External Surfaces Monitoring."

The applicant stated that the External Surfaces Monitoring Program inspects external surfaces of mechanical system components in external air environments requiring aging management for license renewal at frequencies that assure management of the effects of aging so system components will perform their intended functions during the period of extended operation.

The program detects corrosion, flange leakage, missing or damaged insulation, damaged coatings, and indications of fretting or wear. The program also provides inspections of insulated surfaces on a sampling basis which target areas that have been indicated by baseline inspections and operating experience as the most susceptible. Inspection of accessible polymers and elastomers is for age-related degradation, including cracking, peeling, blistering, chalking, crazing, delamination, flaking, discoloration, physical distortion, embitterment (hardening), and gross softening.

The applicant also stated that the program provides for inspections of systems and components normally inaccessible and not readily available when they are made accessible during outages, routine maintenance, or repair or by remote means (bore scope, robotic camera, etc.).

The External Surfaces Monitoring Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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 the applicant's license renewal basis evaluation documents and VEGP-specific procedures for AMP B.3.8, "External Surface Monitoring Program," the license renewal basis evaluation document, and VEGP-specific procedures that pertain to the design, details, and implementation of this AMP. The applicant identifies that the External Surface Monitoring Program is a new AMP that is designed to be consistent with the program elements in GALL AMP XI.M36, "External Surface Monitoring Program," with exceptions.

This program consists of periodic visual inspections of steel components such as piping, piping components, ducting, and other components within the scope of license renewal and subject to AMR in order to manage aging effects. The program manages aging effects through visual inspection of external surfaces for evidence of material loss.

The staff concludes from its review of the license renewal basis evaluation document that the program elements for the VEGP External Surface Monitoring Program are consistent with the program elements in GALL AMP XI.M36 with the following four exceptions. The staff's evaluation on how these exceptions provide for adequate aging management is described in the following:

Exceptions

Exception 1: The LRA states an exception to the "scope of program" and "parameters monitored/inspected" program elements in GALL AMP XI.M36, "External Surface Monitoring Program." Specifically, the exception states:

> The VEGP program scope will include additional materials such as elastomers, aluminum, and copper. The GALL program is described as being applicable to steel components only.

The staff noted that the GALL AMP XI.M36 does not address age related degradation that may occur in elastomers, aluminum and copper materials, susceptible to the age related degradation.

The staff concludes that it is acceptable to include aluminum and copper components within the scope of the AMP, because these materials are metals that can be susceptible to corrosive loss of material effects.

In RAI 3.3-1 and 3.4-1, the staff asked the applicant to clarify how the External Surface Monitoring Program could be used to manage cracking and changes in material properties for polymer based components (including elastomers) with a visual inspection only. The staff's acceptance of the External Surface Monitoring Program is pending acceptable resolution of RAI 3.3-1 and 3.4-1.

By letter dated July 17, 2008, the applicant provided its response to RAI 3.3-1 and 3.4-1. In its response, the applicant stated that this AMP does not only credit visual examinations to detect cracking and changes in material properties of polymers. The applicant further stated that visual examinations will be performed to detect discontinuities and imperfections on the surface of the component, and non-visual examinations such as tactile techniques, which include scratching, bending folding, stretching and pressing will be performed in conjunction with the visual examinations.

The staff noted that VEGP is crediting both visual examinations and tactile techniques to detect for cracking and change in material properties for elastomers and polymers. The staff further noted that applicant described the specific tactile techniques that may be used in conjunction with the visual examination. The staff noted that these techniques include scratching the material surface to screen for residues that may indicate a breakdown of the polymer material, bending or folding of the component which may indicate surface cracking, stretching to evaluate resistance of the polymer material and pressing on the material to evaluate the resiliency. Based on its review of the applicant's response, the staff finds it acceptable because the applicant has indicated that VEGP is not crediting visual examinations alone to detect cracking and change in material properties for elastomers and polymers, and that VEGP has credited tactile techniques, as described above, as well to detect for such aging effects as cracking and change in material properties.

In addition, the staff reviewed the exception and its justification and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The exception, therefore, is acceptable.

Exception 2: The LRA states an exception to the "scope of program" and "detection of aging effects" and "monitoring and trending" program elements in GALL AMP XI.M36, "External Surface Monitoring Program." Specifically, the exception states:

> For areas that are inaccessible during both normal operations and refueling outages, the VEGP program will inspect the area when it is made accessible during maintenance or for other reasons. These areas may also be inspected by remote means (bore scope, robotic camera, etc.).

During the audit and review, the staff asked the applicant to justify the basis for taking this exception. Specifically the staff asked the applicant to provide a clarification on when the alternative methods (such as boroscope inspections or examinations by remote camera) will be implemented if the inaccessible regions are not made accessible in accordance with a reasonable maintenance frequency.

In its response, dated February 8, 200, the applicant stated:

> The inaccessible areas will be inspected when made accessible during the periods of opportunistic inspections. In addition, these areas will be evaluated to ensure that accessible systems and components are constructed of the same materials and are exposed to the same or a more severe environment as the systems and

> components in the inaccessible area. The intent of this evaluation is to ensure and provide a degree of assurance that components in the inaccessible area are not degrading faster than components which are accessible for inspection.
>
> If an opportunistic inspection is not performed within the inspection interval established for that area, the inaccessible area will be inspected either by making the area accessible or by remote means. The determination as to whether the inspection will be performed by direct or remote visual techniques will be performed on a case-by-case basis depending upon factors such as radiation dose rates, personnel safety considerations, size and configuration of the area to be inspected. An area which is determined to be inaccessible due to extreme personnel safety hazards, such as a very high radiation area, will be inspected only when made accessible during maintenance or for other reasons
>
> The existence of leakage detection capability combined with the ability to isolate affected components ensures that leakage will be detected and isolated prior to loss of a component intended function

The staff noted the applicant will inspect inaccessible areas during periods of opportunistic inspections and that VEGP will evaluate these inaccessible areas to ensure that these materials are the same as those in the components and systems in the accessible area with either an equivalent or less severe environment in the inaccessible area. The applicant states that this evaluation is meant to provide assurance that the components in the inaccessible area are not degrading more rapidly than those in the accessible area. The staff further noted that if an opportunistic inspection is not made available during the inspection interval then either the area will be made available or inspected remotely. The staff concludes that the applicant's response is acceptable because inaccessible areas will be inspected when an opportunity is made available by either making them accessible, and performing direct inspection of the components or by using remote inspection techniques.

Based on this assessment, the staff concludes that this exception to the "scope of program," "detection of aging effects," "monitoring and trending," program elements is acceptable and is adequate to manage the aging effects for which it is credited.

Exception 3: The LRA states an exception to the "detection of aging effects," and monitoring and trending," program elements in GALL AMP XI.M36, "External Surface Monitoring Program." Specifically, the exception states:

> The VEGP External Surfaces Monitoring Program is not credited for managing loss of material from internal surfaces. This is conservatively treated as an exception to the GALL statement.

The staff reviewed the information in the VEGP AMP B 3.22, "Piping and Duct Internal Inspection Program, which specifically is the program that is credited for managing loss of material from inner surfaces. This program is consistent with the program described in GALL Report, Section XI.M38, "The VEGP Piping and Duct Internal Inspection Program." The staff's evaluation is documented in Section 3.0.3.2.13 of this SER.

This exception is acceptable, because the staff has verified that the applicant has credited VEGP AMP B 3.22 for managing loss of material from inner surfaces instead of the applicant's External Surface Monitoring Program and because GALL AMP XI.M36 does not intend that the External Surface Monitoring be credited for interior piping component surfaces.

Based on this review, the staff finds that the exception and its justification is acceptable and is adequate to manage the aging effects for which it is credited.

Exception 4: The LRA states an exception to the "program scope,"" preventive actions," "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria" program elements in GALL AMP XI.M36, External Surface Monitoring Program." Specifically, the exception states:

> The acceptance criteria in the program implementing procedures will not cite specific design codes or standards. This is considered an exception to GALL, which states:
>
> Acceptance criteria include design standards, industry codes or standards, and engineering evaluation." The scope of the VEGP External Surfaces Monitoring Program will include a wide range of systems covered by ASME Class 2, ASME Class 3, ANSI B.31.1, NFPA, AWWA, plumbing, and Manufacturer's codes and standards in a variety of pipe and component sizes, therefore specific quantitative acceptance criteria (e.g., minimum pipe wall thickness) will not be included for practical considerations. The inspections will be focused on identifying qualitative indications of corrosion. The quantitative evaluation of deficient conditions, such as comparison of pipe wall thickness with code minimum allowable, will be performed as part of the corrective action process initiated when a Condition Report (CR) is written for a deficient condition.

During the audit and review, the staff asked the applicant its basis for taking this exception and to provide its basis, why AMP B.3.8, External Surfaces Monitoring Program does not include specific acceptance criteria for each of the aging effects monitored by the AMP, as based on one or more recommended source documents referenced in the "acceptance criteria" program element of GALL AMP XI.M36.

In its response, dated February 8, 2008, the applicant stated:

> This exception was included to clarify that the VEGP External Surfaces Monitoring Program will not include specific quantitative acceptance criteria derived from design standards or industry codes such as the ASME Boiler & Pressure Vessel Code. The scope of this program will include a wide range of systems covered by ASME Class 2, ASME Class 3, ANSI B.31.1, National Fire Protection Association, American Water Works Association, plumbing, and manufacturer's codes and standards in a variety of pipe and component sizes. Therefore, the inspections will be focused on identifying qualitative indications of corrosion. The quantitative evaluation of deficient conditions, such as comparison of pipe wall

thickness with code minimum allowable, will be performed as part of the corrective action process initiated by a Condition Report (CR). The CR will identify the specific system and location to be evaluated, so the applicable codes or standards can be readily determined to support the evaluation of the deficient condition and the determination of corrective actions that will be performed in accordance with the corrective action process.

The staff noted the scope of VEGP External Surface Monitoring Program includes a wide range of systems and variety of pipe and component sizes, and because the applicant will apply corrective actions, in accordance with the design code or standard for the component upon any detection or corrosion resulting from this AMP's inspections. The staff noted that the applicant will use the specific code or standard applicable to the component design.

Based on this review, the staff finds that the exception and its justification is acceptable, and satisfies the criteria stated in the "acceptance criteria" program element in GALL AMP XI.M36 because the applicant uses detection of corrosion as a conservative acceptance criterion for initiating appropriate corrective actions.

Operating Experience LRA Section B.3.8 states that this new program has no programmatic operating experience the results of existing system monitoring and material condition reporting programs are relevant. The applicant stated that visual inspection techniques well proven in the industry have been demonstrated as effective in detecting degradation. Corrosion of external surfaces has been reported in the course of various maintenance and surveillance activities that have proven effective in maintaining the material condition of plant systems.

During the audit and review, the staff reviewed the operating experience review discussed in the basis document for the External Surfaces Monitoring Program and finds that the applicant's reviews did not reveal any unusual or significant findings. The staff also finds that the applicant did not identify any age-related related issues not bounded by the industry operating experience.

Based on the aforementioned verification by staff, the staff concludes that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10.

UFSAR Supplement In LRA Section A.2.8, the applicant provided the UFSAR supplement for the External Surfaces Monitoring Program. The staff verified Commitment No. 7 provided in the applicant's letter dated June 27, 2007 and confirmed that this new program is scheduled to be implemented prior to the period of extended operation. The staff has evaluated why this AMP when taken into account with LRA Commitment No. 7 will be adequate to manage loss of material in external component surfaces that are within the scope of this AMP. The staff reviewed the UFSAR Supplement section and determined 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 External Surfaces Monitoring Program, the staff concludes 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Fire Protection Program

Summary of Technical Information in the Application LRA Section B.3.9 describes the existing Fire Protection Program as consistent, with exceptions and enhancements, with GALL AMPs XI.M26, “Fire Protection,” and XI.M27, “Fire Water System.”

The applicant stated that the Fire Protection Program includes inspections, performance testing, and condition monitoring of water- and gas-based fire protection systems, fire barriers, and fire pump diesels and their fuel oil supply components. Program implementation through various plant procedures will manage fire protection components relied upon for 10 CFR 50.48 compliance effectively to maintain intended functions through the period of extended operation.

The gas-based fire protection systems managed by the program include fixed Halon gaseous suppression systems. VEGP does not rely upon fixed-CO_2 gaseous suppression systems to meet 10 CFR 50.48 requirements and thus there are no fixed-CO_2 fire suppression systems within the scope of license renewal.

The program manages water-based fire suppression systems with sprinklers, nozzles, valves, hydrants, fittings, hose stations, standpipes, water storage tanks, and above-ground and underground piping components. The program maintains water-based systems at normal operating pressure and detects and remedies any loss of system pressure promptly.

The applicant also stated that testing and inspection of water- and gas-based fire suppression systems are in accordance with plant procedures based in part on National Fire Protection Association codes and standards. Periodic inspections, performance testing, and system monitoring effectively assures component functionality.

The fire barrier inspections include periodic visual inspection of structural fire barriers, including fire walls, floors, ceilings, fire penetration seals, and fire doors.

Periodic inspections and tests of diesel-driven fire pumps and fuel oil supply components ensure that the diesels, pumps, and fuel oil supply components can perform intended functions.

Enhancements to the Fire Protection Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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 interviewed the applicant's technical staff and reviewed the Fire Protection Program bases documents including VEGP-FSAR Tables 9.5.1-9 and 9.5.1-10. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M26 and XI.M27. The staff noted that CO_2 suppression systems are not relied on at VEGP to meet the requirements of 10 CFR 50.48 and thus they are not within the scope of license renewal.

The staff reviewed those portions of the Fire Protection Program for which the applicant claims 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 Program reasonably assures management of aging effects so components crediting this program can perform intended functions consistent with the CLB during the period of extended operation. The staff finds the applicant's Fire Protection Program acceptable because it conforms to the recommended GALL AMP XI.M26, "Fire Protection," with an exception and enhancements as described below

Exception. The LRA states the following exception to the GALL Report program element:

Element:	3: parameters monitored/inspected 4: detection of aging effects
Exception:	Performance testing of the fixed Halon fire suppression system is performed at 18 month intervals rather than at least once every 6 months as specified by NUREG-1801, Section XI.M26.

During the audit and review, the staff asked the applicant to provide technical justification why the proposed testing frequency is acceptable to detect degradation of the Halon fire suppression system before the loss of the component's intended function.

In its response, the applicant stated that there have been no age-related failures observed in the fixed Halon fire suppression system, which would agree with industry experience in the use of a dried gas. The applicant also stated that it also performs visual inspections of the Halon system for corrosion, physical damage, and nozzles free of corrosion, and obstruction, at 6-month intervals. In addition, if a trend in Halon system degradation is observed during inspections, the VEGP corrective action program requires evaluation of the existing testing and surveillance frequencies.

The staff noted that the GALL Report recommends a six-month periodicity for the full Halon system functional test. In reviewing this exception, the staff noted that the VEGP Fire Protection Program directs Halon fire suppression system surveillance that verifies conditions of external surfaces of the Halon system, and Halon storage tank weight, level, and pressure every six months. Actuation of the system (automatic and manual, including dampers) and flow are verified every 18 months. The program also directs performance of functional operability testing and flow verification, including operation of associated ventilation dampers and manual and automatic actuation. The staff also noted that the current licensing basis for periodic inspection and functional test frequency of the Halon system is every 18 months.

Although the frequency of functional testing exceeds that recommended in GALL AMP XI.M26, the staff concludes that it is sufficient to ensure system availability and operability with the existing surveillance which includes visual inspections of component external surfaces for signs of corrosion and mechanical damage, and verification of Halon storage tank weight, level, and pressure. In addition, the staff's review of the station operating history indicates no aging-related events adversely affecting system operation exists at VEGP. Furthermore, since the VEGP Halon systems are small, one room systems where all system piping is subjected to the same controlled atmospheric environment, they are not subject to any corrosion mechanism. Based on its review of the applicant's program and plant-specific operating experience, the staff finds that the 18-month frequency is adequate for aging management considerations. On this basis, the staff finds this exception acceptable.

Enhancements. The LRA states that the following enhancements to the GALL Report program elements prior to the period of extended operation:

Enhancement 1

Elements:	3. parameters monitored/inspected 4. detection of aging effects
Enhancement:	The VEGP Fire Protection Program will be enhanced to perform wall thickness evaluations on water suppression piping systems using non-intrusive volumetric testing or visual inspections to ensure that wall thicknesses are within acceptable limits, as specified by NUREG-1801, Section XI.M27. Initial wall thickness evaluations will be performed before the end of the current operating term. Subsequent evaluations are performed at plant specific intervals during the period of extended operation. The plant specific inspection intervals will be determined based on evaluation of previous evaluations and site operating experience.

The staff concludes that this enhancement is acceptable because when the enhancement is implemented, Fire Protection Program elements "parameters monitored/inspected," and " detection of aging effects," will be consistent with GALL AMP XI.M27 program elements "parameters monitored/inspected," and " detection of aging effects," which state that wall thickness evaluations of fire protection piping are performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections are performed before the end of the current operating term and at plant-specific intervals thereafter during the period of extended operation. As an alternative to non-intrusive testing, the plant maintenance process may include a visual inspection of the internal surface of the fire protection piping upon each entry to the system for routine or corrective maintenance, as long as it can be demonstrated that inspections are performed (based on past maintenance history) on a representative number of locations on a reasonable basis. The applicant identified this enhancement as Commitment No. 8 (NL-07-1261, dated June 27, 2007) to be implemented prior to the period of extended operation.

Enhancement 2

Elements:	4. detection of aging effects
Enhancement:	The VEGP Fire Protection Program will be enhanced to inspect a sample of sprinkler heads using the guidance of NFPA 25 “Inspection, Testing and Maintenance of Water-Based Fire Protection Systems” (1998 Edition), Section 2-3.1.1, or NFPA 25 (2002 Edition), Section 5.3.1.1.1, as specified by NUREG-1801, Section XI.M27. Where sprinkler heads have been in place for 50 years, they will be replaced or representative samples from one or more sample areas will be submitted to a recognized testing laboratory for field service testing. This sampling is performed every 10 years after the initial field service testing. The 50 years of time in service begins when the system was placed in service, not when the plant became operational.

The staff concludes that this enhancement is acceptable because when the enhancement is implemented, Fire Protection Program element " detection of aging effects," will be consistent with GALL AMP XI.M27 element " detection of aging effects," which states that the sprinkler heads are inspected before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the extended period of operation to ensure that signs of degradation, such as corrosion, are detected in a timely manner. The applicant identified this enhancement as Commitment No. 8 (NL-07-1261, dated June 27, 2007).

Enhancement 3

Elements:	1. scope of program 3. parameters monitored/inspected 4. detection of aging effects 5. monitoring and trending 6. acceptance criteria
Enhancement:	The VEGP Fire Protection Program will be enhanced to provide more detailed instructions for visual inspection of Fire Pump Diesel fuel supply lines for leakage, corrosion, and general degradation while the engine is running during fire suppression system pump tests as specified by NUREG-1801, Section XI.M26.

The staff concludes that this enhancement is acceptable because when the enhancement is implemented, Fire Protection Program elements " scope of program,” “parameters monitored/inspected," " detection of aging effects," " monitoring and trending," and "acceptance criteria" will be consistent with GALL AMP XI.M26 program elements " scope of program," "parameters monitored/inspected," " detection of aging effects," " monitoring and trending," and "acceptance criteria." The applicant identified this enhancement as Commitment No. 8 (NL-07-1261, dated June 27, 2007) to be implemented prior to the period of extended operation.

Operating Experience LRA Section B.3.9 states that operating history shows that the Fire Protection Program has ensured the continued ability of fire protection systems to protect safe-shutdown capability and to prevent radioactive releases as the result of fire. Internal and external assessments have detected programmatic strengths and weaknesses and prompted corrective actions effectively.

The applicant stated that there has been some age-related degradation of fire protection systems and features. Fire water pump casings have lost some material to corrosion; one pump has been replaced and the long-range plan is to replace the rest. Having observed corrosion in the fire water storage tanks and noted tank coating degradation, the applicant plans to replace the coating. The program observed minimal amounts of leakage and corrosion in carbon steel fire protection piping components and took corrective actions. Pinhole leaks discovered in underground cast iron fire protection piping headers were corrected. Some fire penetration seals have experienced shrinkage and degradation that required repairs. There was no loss of intended function as a result of these aging effects.

The applicant also stated there were no age-related failures in the fixed-Halon fire suppression systems. Other failures were from design, installation, or operation and not age-related. Leaking mechanical joints have occurred in underground cast iron piping, a typical problem with bell and spigot joints in buried fire protection piping due to system transient loadings and inadequate restraint. A fire protection header line broke due to a water hammer event. Some under-designed sprinkler system brass valves were replaced with heavier duty valves because of vibration-related cracks.

The staff reviewed the above operating experience and interviewed the applicant's technical staff and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff also reviewed the VEGP operating experience reports, condition reports, and maintenance work orders associated with the corrective actions taken for the identification of signs of degradation of fire protection components. The staff confirmed that the condition reports were closed out by repairs to the degraded fire barriers or performed adequate engineering evaluations for their acceptability. The staff noted that the applicant performs periodic inspections and placed identified deficiencies into their corrective action program to ensure appropriate corrective actions are performed in a timely manner.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.9, the applicant provided the UFSAR supplement for the Fire Protection Program. The staff reviewed the applicant's license renewal commitment list dated June 27, 2007, and confirmed that the implementation of the Fire Protection Program is identified as Commitment No. 8. 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 Fire Protection Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and its 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 Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Flow-Accelerated Corrosion Program

Summary of Technical Information in the Application LRA Section B.3.10 describes the existing Flow-Accelerated Corrosion Program as consistent, with exceptions, with GALL AMP XI.M17, "Flow-Accelerated Corrosion."

The applicant stated that the Flow-Accelerated Corrosion Program manages loss of material (wall thinning) due to such corrosion in susceptible plant piping and other components. The Flow-Accelerated Corrosion Program is based on the guidance of Nuclear Safety Analysis Center (NSAC)-202L-R2, "Recommendations for an Effective Flow-Accelerated Corrosion Program," including subsequent revisions. Program analyses determine susceptible locations, predictive modeling techniques, baseline inspections of wall thickness, follow-up inspections, and repair or replacement of degraded components as necessary. A program update will reflect NSAC-202L-R3.

The applicant also stated that VEGP has elected to replace some carbon steel piping and piping components with flow-accelerated corrosion-resistant chrome-molybdenum alloy steel. Although the alloy steel has increased resistance to flow-accelerated corrosion, the components remain in the scope of the Flow-Accelerated Corrosion Program. The applicant's AMR process defines carbon steel to include low-alloy steel piping as replacement material in lines susceptible to flow-accelerated corrosion. Since the low-alloy steel is more resistant to flow-accelerated corrosion than carbon steel, the aging effects of the carbon steel bound those of the low-alloy steel, resulting in a conservative aging management approach.

The applicant further stated that VEGP also uses the Flow-Accelerated Corrosion Program and its inspection techniques to manage wall thinning in piping components downstream of the SG blowdown demineralizers due not to flow-accelerated corrosion but to the acidic conditions of the demineralizer effluent. The low-temperature, low-pressure environment eliminates flow-accelerated corrosion as a cause for this thinning.

The program inspects and monitors the extent of wall thinning and initiates corrective actions to replace affected components prior to loss of intended function.

Staff Evaluation During its audit and review, the staff confirmed 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 the information in LRA AMP B.3.10, Flow-Accelerated Corrosion Program, the VEGP program basis documents, and VEGP-specific procedures that pertain to the design, details, and implementation of this AMP. The applicant identifies that the Flow-Accelerated Corrosion Program is an existing AMP that is designed to be consistent with the program elements in GALL AMP XI.M17, Flow-Accelerated Corrosion, with exceptions. The staff concludes, from its review of the LR basis evaluation document, that the program elements for the Flow-Accelerated Corrosion Program were consistent with the program elements in GALL AMP XI.M17 with the following seven exceptions. The staff's evaluations on how these exceptions provide for adequate aging management in lieu of conforming to the criteria in the applicable recommended program elements of GALL AMP XI.M17, "Flow-Accelerated Corrosion" are described in the subsequent subsections.

Exception

Exception 1: The LRA states an exception to the "scope of program" and "detection of aging effects" program elements in GALL AMP XI.M17, "Flow-Accelerated Corrosion." Specifically, the exception states:

> SNC continuously improves the program through updates to reflect industry operating experience and guidance document revisions. NUREG-1801, Volume 2, Section XI.M17, cites NSAC-202L-R2, "Recommendations for an Effective Flow-Accelerated Corrosion Program," as the accepted source document for development of a Flow-Accelerated Corrosion (FAC) Program. EPRI Report 1011838 (NSAC-202L-R3) has been issued, which supersedes all prior versions of NSAC-202L. SNC is updating the FAC Program to reflect the recommendations of EPRI Report 1011838 (NSAC-202L-R3). The revised NSAC-202L contains recommendations updated with the experience of members of the CHECWORKS™ Users Group, plus recent advances in detection, modeling, and mitigation technology. These recommendations are intended to refine and enhance those of earlier versions, without contradiction, so as to ensure the continuity of existing plant FAC programs. The differences between revisions 2 and 3 of this report have been evaluated and are being incorporated into the implementing procedures governing the FAC Program.

GALL AMP XI.M17 recommends that FAC programs be developed and implemented in accordance with the industry guidelines recommended in EPRI Report No. NSAC-202L-R2, "Recommendations for an Effective Flow Accelerated Corrosion Program" (April 1999). The applicant has proposed to use the most recent version of the EPRI NSAC guidelines on FAC, which are currently described in EPRI Report 1011838 (NSAC-202L-R3).

During the audit and review, the staff noted that the applicant had performed a comparison of the guidelines recommended in EPRI Report 1011838 from those previously recommended in EPRI Report No. NSAC-202L-R2. In order to determine whether the update of the recommendations would continue to provide adequate aging management of FAC for those systems and components that are within the scope of the program. The staff concludes that, like EPRI Report No. NSAC-202L-R2, EPRI Report 1011838 continues to recommend: (1) that flow-accelerated corrosions program perform an integrated modeling of the carbon steel systems and low chromium (,< 1%-wt. Cr) low-alloy steel systems, (2) that the modeling be done in accordance of a industry-wide model such as CHECWORKS, (3) that the condition monitoring inspections be done by ultrasonic testing (UT), and (4) that the inspection results be evaluated in accordance with an appropriate wear rate assessment model and wear rate acceptance criteria, such as that provided in the modeling of CHECWORKS. The staff concludes that the applicant's Flow-Accelerated Corrosion Program including modeling and assessment of the VEGP plant-specific piping is in accordance with the latest version of CHECWORKS developed by EPRI and that the applicant performs examinations of accessible in-scope components using UT. Alternative inspection methods proposed by the applicant are evaluated under Exception 6. Based on this assessment, the staff concludes that it is acceptable to use EPRI Report No. 1011838 (i.e. EPRI Report No. NSAC-202L-R3) as the alternative industry-basis document for the applicant's Flow-Accelerated Corrosion Program because the updated report continues to recommend plant-specific modeling and the type of NDE inspections that were previously recommended for implementation in EPRI Report NSAC-202L-R2.

Exception 2: The LRA states an exception to the "scope of program" program element in GALL AMP XI.M17, "Flow-Accelerated Corrosion." Specifically, the exception states:

> The NUREG-1801 program discussion includes steam generator feedwater and steam outlet nozzle safe ends. The VEGP steam generator feedwater nozzles and steam outlet nozzles do not have safe ends. In addition, the VEGP steam outlet nozzles are not considered to be FAC susceptible based on steam quality.

EPRI Report No. 1011838 (i.e. EPRI Report No. NSAC-202L-R3) recommends that carbon steel or low Chromium content (< 1.0% Cr) low-alloy steel systems be incorporated into a plant's FAC program if they are subject to high energy single phase aqueous or two phase water/steam environments. The staff asked the applicant to identify what the average quality was for the steam environment for the steam generator steam outlet nozzles. The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant responded that the steam quality for these components was 99.7% dry steam. This is a sufficiently dry quality to exclude this environment from being defined as a high energy two phase water/steam environment. Based on this determination, the staff concludes that it is valid to exclude the steam generator outlet nozzles from the scope of the applicant's flow-accelerated corrosion program. The staff also determined that the feed water nozzle thermal sleeves and steam generator outlet nozzle thermal sleeves do not need to be modeled within the scope of this program because they are not included in the plant's design. Based on this assessment, the staff concludes that this exception is acceptable.

Exception 3: The LRA states an exception to the "scope of program" program element in GALL AMP XI.M17, "Flow-Accelerated Corrosion." Specifically, the exception states:

> The GALL program implies that all systems constructed of carbon steel and containing any high-energy fluid (two phase as well as single phase) are within the scope of the FAC program. The VEGP FAC Program takes exception to the environments which are prone to FAC as implied by the GALL Scope statement.

> The VEGP FAC Program excludes any systems that do not transport water or steam. Systems that transport superheated or “dry” steam are also excluded from the VEGP FAC Program. This is consistent with the guidance provided in EPRI Report 1011838 (NSAC-202L-R3), Section 4.2.1, Potential Susceptible Systems.

The staff does not consider this to be an exception to the recommendation in GALL AMP XI.M17, Flow-Accelerated Corrosion. The applicable EPRI FAC guidelines (i.e., EPRI Report No. NSAC-202L-R2 as recommended in GALL AMP XI.M17 or EPRI Report No. 1011838 as accepted by the staff under Exception 1 above) apply to FAC that is induced by single phase water or two phase water/steam environments. The applicable EPRI FAC guidelines indicate that dry steam or superheated steam (which contains greater than 99.7% dry steam with extremely low aqueous water content levels) are not conducive environments for initiation and development of FAC in the manner that single phase water or two phase water/steam environments are. Thus, based on this assessment, the staff concludes that it is appropriate and acceptable to exclude carbon steel or low Chromium content (< 1.0% Cr) low-alloy steel piping systems from the scope of the Flow-Accelerated Corrosion Program if the environment for the components is either superheated or dry steam or if the piping system does not transport water or steam because this is consistent with the recommendations in the applicable EPRI FAC guidelines.

Exception 4: The LRA states an exception to the “scope of program” program element in GALL AMP XI.M17, “Flow-Accelerated Corrosion.” Specifically, the exception states:

> The GALL program explicitly limits the materials subject to FAC inspections to carbon steel. The VEGP FAC Program includes an exception to the GALL program scope by including low alloy steel with a chromium content of less than 1.25% as being susceptible to FAC. This is consistent with the guidance provided in EPRI Report 1011838 (NSAC-202L-R3), Section 4.2.2, Exclusion of Systems from Evaluation.

The “scope of program” program elements states that the program is applicable to carbon steel systems and does not specifically mention systems fabricated from low-alloy steel materials, which are also ferritic steels. However, the guidelines in EPRI Report No. NSAC-202L-R2 and in EPRI Report No. 1011838 indicate that low-alloy steel systems may be susceptible to FAC if their Chromium levels are less than 1.0% alloying content and if they are exposed to high energy single-phase aqueous or high energy two-phase aqueous/steam environments. The applicant has conservatively included those low-alloy steel systems within the scope of this AMP if their Chromium content is less than 1.25 %-Wt. and if they are exposed to either a high energy single-phase water environment or a high energy two-phase water/steam environment. Carbon steel systems exposed to these environments are also within the scope of this AMP. The staff considers this to be consistent with GALL in that the applicant does include carbon steel systems within the scope of this program. The staff also determined that the inclusion of low Chromium content (< 1.25 %-Wt.) low-alloy steel systems in the program is a conservative supplement of the program rather than an exception to GALL.

Therefore, the staff concludes that it is acceptable and conservative to include low Chromium content (< 1.25% Cr) low-alloy steel systems within the scope of the applicant's Flow-Accelerated Corrosion Program if they exposed to a high energy single-phase water environment or a high energy two-phase water/steam environment.

Exception 5: The LRA states an exception to the "scope of program" program element in GALL AMP XI.M17, "Flow-Accelerated Corrosion." Specifically, the exception states:

> The VEGP FAC Program will encompass wall thinning resulting from FAC and can also be used to manage similar phenomena such as cavitation, impingement, and erosion, for piping or components whose failure could result in personnel injuries or detrimental operation effects in systems determined to be susceptible to FAC. The GALL Program does not consider use of the FAC Program to monitor wall thinning from mechanisms other than FAC.

The "scope of program" element in GALL AMP XI.M17, "Flow-Accelerated Corrosion," limits the scope of FAC programs only to loss of material in carbon steel systems that is induced by FAC. The "scope of program" program element in GALL AMP XI.M17, Flow-Accelerated Corrosion, states that volumetric techniques such as ultrasonic testing (UT) or radiography testing (RT) are acceptable to monitor for loss of material due to FAC. The scope of the applicant's program includes UT examinations of both carbon steel systems and low Chromium content (< 1.25%) low-alloy steel systems that are exposed to high energy, single phase water or two phase water/steam environments. This is consistent with the "scope of program" program element in GALL AMP XI.M17 and is acceptable. However, the same UT inspection techniques are capable of monitoring for other mechanisms the may induce loss of material in these systems, such as cavitation, impingement (fretting), or erosion. This is a conservative supplement of this program rather than an exception to GALL AMP XI.M17. Therefore, the staff concludes that it acceptable to include these additional aging mechanisms within the scope of the applicant's Flow-Accelerated Corrosion Program.

Exception 6: The LRA states an exception to the "detection of aging effects" program element in GALL AMP XI.M17, "Flow-Accelerated Corrosion." Specifically, the exception states:

> The VEGP FAC Program includes inspection methodology that is considered an exception to the GALL program. In addition to UT and RT, the VEGP FAC Program permits the use of other industry-accepted inspection techniques where practical. In certain large-bore systems, visual inspection (VT) of the piping inner surfaces may be performed. Visual inspections provide immediate indications of FAC. Follow-up UT may be used to confirm or to quantify visual inspection results. This is consistent with the guidance provided in EPRI Report 1011838 (NSAC-202L-R3).

The exception taken by the applicant would permit the use of RT and VT techniques under certain circumstances. The staff informed the applicant that VT and RT examination methods were not capable of sizing flaws throughout the depth of a component (through a components thickness). The staff asked the applicant to justify how RT and VT as techniques that could size relevant flaw indications throughout a components thickness. In its response, the applicant stated that RT could be used as a sizing technique only for small bore piping, in that an angle beam RT shot could achieve an indication of the components thickness and that VT techniques could not be used to size the extent of a flaw into a components thickness. The applicant stated that it would use UT as a follow-up sizing technique for any flaws detected as a result of VT or RT tests on large bore piping and UT or RT as a sizing technique for any flaws detected as a result of RT or VT on small-bore piping.

The staff asked for additional clarification on how RT would be used as a sizing technique for flaw indications. Specifically, the staff asked the applicant to Clarify whether VEGP has qualified RT as a sizing technique in accordance with the VEGP performance demonstration initiative (PDI) or some other NRC-accepted qualification process and if so, identify the type of components and components sizes that the qualification process has qualified RT for as a sizing technique. If RT has not been qualified as a sizing technique under the PDI, justify why it is acceptable to use RT as a sizing technique for flaw indications that are detected in ASME Code Class components.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that RT is used only as a technique to measuring wall thickness and is not used to detect the size of flaws in the piping. The applicant further stated that since the RT is not used as a technique to detect or size flaws, it is not required to be qualified in accordance with a performance demonstration initiative (PDI) qualification process. The staff concludes that the applicant's response is acceptable because it provided clarification that any RT techniques used in accordance with the FAC Program would only be used for the detection of wall thickness and not used to size relevant flaw indications that may be indicated as parts of the programs UT inspection techniques. This question is resolved.

Exception 7: The LRA states an exception to the "acceptance criteria" program element in GALL AMP XI.M17, "Flow-Accelerated Corrosion." Specifically, the exception states:

> The VEGP FAC Program includes pipelines or components that cannot be accurately modeled due to widely varying or unknown operating conditions, or other reasons. The GALL program does not address pipelines or components that cannot be modeled. The inspection results for these unmodeled pipelines or components are evaluated by engineering judgment. This is consistent with the guidance provided in EPRI Report 1011838 (NSAC-202L-R3).

The staff asked the applicant to provide more specific details on how in-scope components in un-modeled systems would be scheduled for examination and how the results of these examinations would be evaluated. Specifically the staff asked the applicant to:

a. Clarify what type of wear rate projection, flaw growth, or engineering criteria will be used to determine whether such unmodeled in-scope piping systems or components will be scheduled for appropriate NDE examinations.
b. Clarify what type of NDE methods will be applied for the inspections of the unmodeled components within the scope of this AMP.
c. Clarify what type of engineering judgment criteria will be used to assess the inspection results for those unmodeled components that are scheduled and receive the NDE examinations identified in your response to Part B of this question.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated the following:

a. Systems which cannot be modeled are compared to the susceptibility criteria of EPRI Report 1011838 (NSAC-202L-R3). For systems which are considered to be susceptible to FAC, a sample of components in each system is selected for inspection based on known problem areas (such as pressure drops, changes in direction, and splitting or combining flows).
b. The same NDE methods are applied for modeled and unmodeled components (primarily UT).
c. Unmodeled components are evaluated using the same methods as modeled components, with the exception of the lack of a modeled prediction of wear. Fitness for service and remaining service life is evaluated based on measured wear, with a safety factor applied in accordance with EPRI Report 1011838 (NSAC-202L-R3).

   The staff finds the applicant's response to be acceptable because it provided clarification that it uses the susceptibility criteria in EPRI Report 1011838 (i.e. NSAC-202L-R3) to assess those systems that cannot be adequately modeled by CHECWORKS and to sample components for inspection if it is determined that a non-modeled system is susceptible to FAC, and because the applicant has stated that it uses the same NDE inspection and evaluation techniques as those used for the systems that can be modeled in accordance with the CHECWORKS predictive code, which are based on these EPRI guidelines. Based on this assessment, the staff concludes that the applicant's Flow-Accelerated Corrosion Program has an acceptable method for inspecting and evaluating non-modeled steel systems (i.e., carbon steel or alloy steel systems) because the applicant is applying an applicable EPRI guideline document for the evaluation of these systems and because these EPRI guidelines used by the applicant have been determined by the staff to be an acceptable basis for establishing and implementing the applicant's Flow-Accelerated Corrosion Program (refer to the staff's acceptance of the EPRI NSAC-202L-R3 guidelines in its evaluation of Exception 1 for this AMP).

Based on this review, the staff has verified that those program element aspects which the applicant claims are consistent with the recommended program elements in GALL AMP XI.M17, Flow-Accelerated Corrosion," were indeed consistent with the corresponding program element criteria in the GALL AMP, and are acceptable. The staff has also evaluated those exceptions taken to the program element criteria that are recommended in GALL AMP XI.M17, "Flow-Accelerated Corrosion," and, based on the evaluations of these exceptions provided in the previous paragraphs, has determined that the exceptions taken to GALL AMP XI.M17 will ensure adequate management of loss of material due to FAC and other loss of material inducing mechanisms in those components that are within the scope of Flow-Accelerated Corrosion Program.

Based on the audit and review, the staff concludes that the Flow-Accelerated Corrosion Program is consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion," as modified by the seven (7) exceptions that have been found to be acceptable by the staff, and is acceptable to manage loss of material due to FAC and other loss of material inducing mechanisms in the carbon steel and low alloy steel systems and components for which the AMP is credited.

Operating Experience LRA Section B.3.10 states that program effectiveness is demonstrated by results, which are consistent with industry experience. Wall thickness inspections since 1991 have replaced numerous components and piping segments in susceptible systems, including more than 3100 ft of susceptible small-bore pipe replaced with materials resistant to flow-accelerated corrosion. While the program continues to detect areas of pipe wall thinning, there have been no leaks in large-bore piping on either unit attributed to flow-accelerated corrosion since 1992. A small number of leaks from small-bore piping (not modeled on CHECWORKS™) continue but the frequency has dropped significantly as piping replacement has progressed.

The applicant also stated that VEGP has experienced chemical wastage of piping components downstream of the SG blowdown demineralizers believed to be due to acidic conditions of the demineralizer effluent. As the blowdown passes through the demineralizers they strip out ammonia and leave the effluent acidic. Inability to vent the demineralizer vessels completely introduces oxygen into the blowdown effluent, resulting in higher oxidation rates. The low-temperature, low-pressure environment eliminates flow-accelerated corrosion as a cause for this thinning. Flow-Accelerated Corrosion Program inspection techniques manage this aging effect.

The staff reviewed the "operating experience" program element description provided in the applicant license renewal basis evaluation document for the Flow-Accelerated Corrosion Program, and determined that the program incorporates generic and VEGP-specific flow-accelerated corrosion events as part of the criteria for determining and selecting components for the UT inspections that are implemented in accordance with this AMP. The staff verified that the program incorporates relevant experience discussed in the following NRC generic communications:

- BL 87-01, "Thinning of Pipe Walls in Nuclear Power Plants," November 6, 1987.
- GL 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning," May 2, 1989.
- IN 89-53, "Rupture of Extraction Steam Line on High Pressure Turbine," November 6, 1987.
- IN 91-18, High-Energy Piping Failures Caused by Wall Thinning, March 12, 1991.
- IN 92-35, "Higher Than Predicted Erosion/Corrosion in Unisolable Reactor Coolant Pressure Boundary Piping Inside Containment at a BWR," May 6, 1992.
- IN 93-21, Summary of NRC Staff Observations Compiled During Engineering audits or Inspections of Licensee Erosion/Corrosion Programs, March 25, 1993.
- IN 95-11, "Failure of Condensate Piping Because of Erosion/Corrosion at a Flow-Straightening Device," February 24, 1995.
- NRC Information Notice 97-84, "Rupture in Extraction Steam Piping as a Result of Flow-Accelerated Corrosion," December 11, 1997.

The staff noted, from its license renewal basis evaluation document for this AMP, that the applicant has indicated that it had also assessed the most recent U.S. industry operating experience discussed in NRC IN 2001-09, "Main Feedwater System Degradation in Safety-Related ASME Code Class 2 Piping Inside Containment of a Pressurized Water Reactor," dated June 12, 2001, but had concluded that the applicant's Flow-Accelerated Corrosion Program bounds the relevant operating discussed in IN 2001-09, because: (1) the VEGP program performs more FAC inspections than does the corresponding licensee for plants discussed and analyzed in IN 2001-09, (2) VEGP historically maintains excellent water chemistry conditions, (3) VEGP continually maintains and updates its CHECWORKS code to incorporate relevant VEGP-specific and generic operating experience, (4) the VEGP program already incorporates inspections of susceptible counter-bored piping weld areas, and (5) VEPG does not limit selection of inspection locations to only those predicted by CHECWORKS.

In NRC IN 2001-09, the NRC refers to an operational FAC-induced failure event that had occurred in the moisture separator reheater drain line piping of a U.S PWR in August 11, 1999. This event is significant because the rate of flow-accelerated corrosion that had occurred downstream of a moisture separator reheater drain line pipe elbow weld had been exacerbated due to the presence of a backing bar in the weld configuration. The presence of the backing bar resulted in more turbulent down-stream flow conditions (leading to a combination of FAC and cavitation) and had accelerated the rate of corrosion in the failed piping beyond that which would have been predicted by CHECWORKS and because the licensee did not conform to the EPRI FAC guideline recommendations for inspecting piping downstream of a susceptible pipe weld location. The staff concludes that the current program is sufficient to address this industry experience because it conforms to EPRI Report 1011838.

The staff asked the applicant to clarify how their CHECWORKS modeling bounds turbulent flow conditions that could be induced by the presence of backing bars in the piping and to clarify whether it implements the pipe length inspection criteria recommended in EPRI Report NSAC-202L-R2, or its updates. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant provided the following response:

> The VEGP Flow-Accelerated Corrosion (FAC) Program implements the guidance of NSAC-202L, revision 3, which addressed the operating experience from the 1999 incident at Calloway and the related follow-up inspections that were performed in 2001 and which are discussed in Information Notice 2001-09.
>
> While VEGP typically has not used backing rings in piping with a design pressure of 600 psig or higher, for lower pressure piping the piping specification allows use of backing rings for certain piping material classifications. Weld locations are subject to more detailed inspection, in part because backing rings could exist in some piping. In accordance with the VEGP FAC UT inspection procedure, the entire grid square is scanned for the grid adjacent to each side of each weld, as opposed to scanning just the grid intersection points (NMP-ES-024-510, paragraph 12.2.5). This ensures identification of any accelerated wear occurring near the weld such as might occur from undercutting of a backing ring.
>
> The VEGP program implements the recommendations in EPRI Report NSAC-202L, revision 3, section 4.5.2, regarding grid coverage for piping components. This section recommends that "the inspection grid extend from two grid lines upstream of the toe of the upstream weld to a minimum of two grid lines or 6 inches (150 mm), whichever is greater, beyond the toe of the downstream weld." For expanding components it is further recommended that "The grid should be extended upstream 2 grid lines or six inches (150 mm), whichever is greater."

Grid extensions beyond that are only needed if a degrading trend or significant damage is noted. The "two diameters" figure is provided as a consideration to avoid the potential for having to expand grid coverage after initial inspection. The SNC procedure, NMP-ES-024-510, paragraph 10.5, specifies grid coverage of 2 grids or 4" upstream to 2 grids or 12" downstream. For expanding components the upstream grid is 2 grids or 12", therefore SNC practices envelope the actual NSAC-202L recommendations.

The staff concludes that the Flow-Accelerated Corrosion Program bounds the operating experience discussed in IN 2001-09 because (1) the program elements of the AMP have been determined to be consistent with recommended inspection guidelines of EPRI Report No. 1011838, (2) the applicant's CHECWORKS modeling of the VEGP piping accounts for pipe welds that could have potentially counter-bored weld geometries and backing bars in service, and (3) the applicant's criteria for performing the UT inspections under this program conforms to the criterion in EPRI Report No. 1011838 for inspecting lengths of pipe upstream and downstream of carbon steel or low alloy steel pipe welds.

Based on this review, the staff concludes that the applicant's Flow-Accelerated Corrosion Program adequately addresses industry operating experience related to FAC.

Based on this review, the staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.10, 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).

<u>Conclusion</u> On the basis of its audit and review of the applicant's Flow-Accelerated Corrosion Program, the staff concludes 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Flux Thimble Tube Inspection Program

<u>Summary of Technical Information in the Application</u> LRA Section B.3.11 describes the existing Flux Thimble Tube Inspection Program as consistent, with enhancement, with GALL AMP XI.M37, "Flux Thimble Tube Inspection."

The applicant states that the Flux Thimble Tube Inspection Program manages loss of material due to fretting or wear of the incore flux detector thimble tubes. The program responds to NRC Bulletin No. 88-09, "Thimble Tube Thinning in Westinghouse Reactors," using proven nondestructive examination techniques to monitor for wear of the flux thimble tubes. The program evaluated the test results to determine the wear rate using proprietary methodology which applies an allowance for uncertainty to the measured wear data, then compares the wear rate predictions against the acceptance criteria to determine the need for corrective actions (e.g., repositioning, capping, or replacing a flux thimble tube). The wear rate predictions also establish the interval to the next inspection. The Flux Thimble Tube Inspection Program will be enhanced prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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.

The staff reviewed those portions of the Flux Thimble Tube Inspection Program for which the applicant claims consistency with GALL AMP XI.M37 and found that they are consistent with the GALL Report AMP. Furthermore, the staff concludes that the applicant's Flux Thimble Tube Inspection Program is an acceptable program to manage aging of incore flux detector thimble tubes for the period of extended operation. The staff finds the applicant's Flux Thimble Tube Inspection Program acceptable because it conforms to the recommended GALL AMP XI.M35, "Flux Thimble Tube Inspection," with the enhancement as described below:

Enhancement: The LRA states the following enhancement to the following GALL Report program element:

Element:	7: corrective actions
Enhancement:	An overall program procedure will be prepared which describes the activities and controls which have been implemented to manage wall thinning of the flux thimble tubes.

In Enclosure 2 of the letter dated, June 27, 2007 the applicant made a commitment (Commitment No. 9) to enhance the Flux Thimble Tube Inspection Program by preparing an overall program procedure documenting the Flux Thimble Tube Inspection Program administration and implementing activities credited for license renewal. The staff finds this enhancement and commitment acceptable, since the enhanced program implementing procedures will address the recommendations of the GALL Report and be consistent with the corrective actions program element.

The staff reviewed the results of the Vogtle flux thimble eddy current inspection data evaluation for refueling outages 1R12 and 2R12 for Unit 1 and Unit 2, respectively. The evaluation contained the results of previous eddy current data. The staff noted that no adverse trends were identified by the inspections. The staff also noted that the inspection data specified the acceptance criteria threshold that determines whether corrective action is required. The staff finds this commitment acceptable, since the program enhancement will address the recommendations of the GALL Report.

Operating Experience LRA Section B.3.11 states that no through-wall leaks of flux thimble tubes have been observed, but that wear has exceeded the acceptance criteria in several flux thimble tubes resulting in corrective measures. Some tubes have been repositioned to introduce new wear surfaces, other tubes have been capped.

The applicant's evaluation of the latest eddy current test data for Unit 1 during the Unit 1 twelfth refueling outage (Spring 2005) indicated that the in-service flux thimble tubes would be satisfactory for continued operation through the fourteenth refueling outage and that two tubes would be within 1 percent of the administrative acceptance criteria limit of 70-percent through-wall wear if they continue in operation until then.

The applicant's evaluation of the latest eddy current test data for Unit 2 during the Unit 2 twelfth refueling outage (Spring 2007) indicated that the in-service flux thimble tubes would be satisfactory for continued operation and would not approach the acceptance criteria limit through the fourteenth refueling outage.

During the audit and review, the staff reviewed the inspection results from its most recent flux thimble inspections and their evaluations. The staff confirmed the results of the inspection did not indicate actual flux thimble tube wear outside of predicted values.

The staff reviewed the operating experience in the LRA which is consistent with industry operating experience. Additionally, the staff compared the recommendations of IE Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," to determine consistency with the Flux Thimble Tube Inspection Program. The staff finds that the Flux Thimble Tube Inspection Program is consistent with the recommendations of IE Bulletin 88-09, which is based on industry operating experience.

On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the staff finds that the applicant's Flux Thimble Tube Inspection Program will adequately manage the aging effects for which the AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.11, the applicant provided the UFSAR supplement for the Flux Thimble Tube Inspection Program. Also, in a letter dated June 27, 2007, the applicant provided Commitment No. 9 to enhance the Flux Thimble Tube Inspection Program prior to the period of extended operation. 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 Flux Thimble Tube Inspection Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancement and confirmed that its implementation through Appendix A. Commitment No. 9 prior to the period of extended operation would make the existing AMP consistent with the GALL Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Generic Letter 89-13 Program

Summary of Technical Information in the Application LRA Section B.3.12 describes the existing Generic Letter 89-13 Program as consistent, with exception and enhancements, with GALL AMP XI.M20, “Open-Cycle Cooling Water System.”

The applicant stated that Generic Letter 89-13 Program responds to the recommendations of GL 89-13, “Service Water System Problems Affecting Safety-Related Equipment.” The Generic Letter 89-13 Program includes mitigation as well as performance- and condition-monitoring techniques to manage the effects of aging on the NSCW system and on components the system supplies.

The applicant also stated that the prevention or mitigation of fouling and loss of material in the NSCW system and NSCW-supplied components is achieved in part by intermittent injection of appropriate water treatment chemicals. Other preventive and monitoring aspects of the Generic Letter 89-13 Program include periodic flushing of lines to mitigate or prevent fouling, periodic measurement of flow rates through selected components, periodic analysis of corrosion coupons, periodic cleansing of selected heat exchangers, and visual inspection of some components for fouling or loss of material. Volumetric examination may detect degradation. Enhancements to the Generic Letter 89-13 Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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 Generic Letter 89-13 Program for which the applicant claims consistency with GALL AMP XI.M20, “Open-Cycle Cooling Water System,” and found that they are consistent with the GALL Report AMP. Furthermore, the staff concludes that the applicant’s Generic Letter 89-13 Program will properly manage the aging of the NSCW system components and components this system supplies for the period of extended operation. The staff finds the applicant’s Generic Letter 89-13 Program acceptable because it conforms to the recommended GALL AMP XI.M20 with the exception and enhancements as described below.

The LRA states an exception to the following GALL Report program element:

Element: 5: monitoring and trending

Exception: The VEGP Generic Letter 89-13 Program activities are performed at a variety of intervals depending on the component, the parameter being monitored, and results of previous inspections. The GALL Report states that testing and inspections are done annually and during refueling outages.

The Generic Letter 89-13 Program activities are performed at intervals consistent with the VEGP commitments made in response to GL 89-13. Inspection intervals range from monthly for some flow measurements to ten years for NSCW pump removal and refurbishment.

The staff finds that this exception is acceptable because it has been previously reviewed and accepted by the staff and is part of the CLB.

The applicant's LRA for the Generic Letter 89-13 Program stated the following enhancements:

Enhancement 1. The LRA states an enhancement to the following GALL Report program element:

Element: program description

Enhancement: An overall program procedure will be prepared which describes the various program activities that comprise Generic Letter 89-13 Program and their implementing controls such as chemistry procedures, maintenance activities, scheduled surveillances, or other mechanisms.

In Enclosure 2 of letter dated, June 27, 2007, the applicant made a commitment (Commitment No. 11) to enhance the Generic Letter 89-13 Program by preparing an overall program procedure documenting the program administration and implementing activities credited for license renewal. The staff finds this commitment and enhancement acceptable because the applicant has committed to develop a comprehensive program procedure to govern the overall activities to be performed under the Generic Letter 89-13 Program. The staff finds this to be an acceptable way to document, communicate and control all of the activities which are committed to under this program.

Enhancement 2. The LRA states an enhancement to the following GALL Report program element:

Element: 3: parameters monitored or inspected

Enhancement: The VEGP Generic Letter 89-13 Program activities will be enhanced to include:

- Inspection of the NSCW transfer pumps' casings and bolting

- Inspection of the NSCW cooling tower spray nozzles as a specific item to be inspected during cooling tower inspections

In Enclosure 2 of the letter dated, June 27, 2007, the applicant also included in Commitment No. 11 the expansion of the Generic Letter 89-13 Program by including the above component inspections.

The staff finds this enhancement and the associated expansion to Commitment No. 11 acceptable because it expands the scope of the GL 89-13 Program to include additional components.

The staff reviewed those portions of the GL 89-13 Program that the applicant claimed are consistent with the GALL Report and found them consistent. The staff found the exception acceptable because it has been previously approved by the staff and is part of the CLB. Further, the staff found the enhancement acceptable because it expands the scope of the program to include additional components in the program. Therefore, the staff finds the licensee's implementation of the GL 89-13 Program to be acceptable.

Operating Experience LRA Section B.3.12 states that implementation of an inspection program for safety-related heat exchangers began with the Fall 1990 Unit 2 refueling outage in response to concerns raised in GL 89-13. Inspection results typically indicated traces of silt. A small number of those early inspections found minor amounts of debris in some heat exchangers. In 1993 the heat exchanger inspection frequency was extended due to the favorable results.

The applicant stated that beginning in 1993, various inspections found debris sufficient to block tubes in several heat exchangers. In addition, investigation of a high component cooling water motor-winding temperature revealed the motor cooler's NSCW supply flow orifice blocked by debris and blockage in the NSCW supply to an NSCW pump motor cooler. Due to the repeated instances of NSCW component fouling, in October 1995 the staff issued Unresolved Item 424, 425/95-12-04, which was closed in December 1995 when the staff opened Level 4 Violation 424, 425/95-27-04.

To address the flow blockage, the applicant stated that in 1995 it instituted periodic flow measurements for small-diameter flow orifices, implemented several modifications to prevent debris from entering the NSCW cooling towers, inspected and cleaned the cooling tower basins by diving services, and expanded the scope of inspection during the 1996 refueling outage on each unit. Furthermore, analysis indicated that some debris was the result of Colmonoy coating flaking off of NSCW pump sleeves and wear rings. The applicant refurbished the NSCW pumps to eliminate this coating as a source of debris.

The applicant also stated that more aggressive monitoring and inspection program in response to the flow blockage has detected fouling of flow orifices and heat exchangers effectively prior to loss of function (*e.g.*, measured NSCW flows outside of the "expected" range but within the "acceptable" range and accumulation of minor amounts of debris with no effect on heat exchanger performance).

The applicant further stated that loss of material has caused leaks at the containment cooler tube to header connections. The long-range plan for containment coolers recommended replacement of the cooling coils with stainless steel tubing material and of the header design with a waterbox-type design. Three Unit 2 coils and one Unit 1 coil had been replaced as of Fall 2006.

As a result of observations of scale material (calcium and silica) made by the applicant from the well water makeup system on the spray ring header of the NSCW towers, VEGP monitors the Ryznars Stability Index, which indicates conditions leading to the formation of scale. Blowdown maintains this index within limits.

During the audit and review, the staff confirmed by reviewing selected operating experience documents that the VEGP actions taken in response to GL 89-13 have been effective in identifying fouling of flow orifices and heat exchangers, and in identifying loss of material from NSCW-supplied components, prior to loss of intended function.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.12, the applicant provided the UFSAR supplement for the Generic Letter 89-13 Program. Also, in a letter dated June 27, 2007, the applicant provided Commitment No. 11 to enhance the Generic Letter 89-13 Program prior to the period of extended operation. 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 Generic Letter 89-13 Program, the staff concludes 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. Also, the staff reviewed the enhancements and confirmed that their implementation through Commitment No. 11 prior to the period of extended operation would make the existing AMP consistent with the GALL Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Oil Analysis Program

Summary of Technical Information in the Application LRA Section B.3.16 describes the existing Oil Analysis Program as consistent, with exception and enhancements, with GALL AMP XI.M39, "Lubricating Oil Analysis."

The Oil Analysis Program maintains the lubricating oil and hydraulic fluid environments in the in-scope mechanical systems to the required quality. The Oil Analysis Program maintains lubricating oil and hydraulic fluid system contaminants (primarily water and particulates) within acceptable limits to preserve an environment not conducive to deleterious aging effects. The program samples and analyzes lubricating oil and hydraulic fluid for detrimental contaminants. The One-Time Inspection Program the effectiveness of the Oil Analysis Program. Enhancements to the Oil Analysis Program will be implemented prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff confirmed the applicant's claim of consistency with the GALL Report.

Staff noted that the applicant identifies that the Oil Analysis Program is consistent with the program described in GALL AMP XI.M39, “Lubricating Oil Analysis Program (henceforth referred to as GALL AMP XI.M39), with two exceptions to the “scope of program,” “preventative actions,” “parameters monitored/inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “operating experience” program elements in GALL AMP XI.M39 and three enhancements of the AMP.

The staff reviewed those portions of the Oil Analysis Program for which the applicant claims consistency with GALL AMP XI. M39. Specifically, the staff reviewed the information in AMP B.3.16, “Oil Analysis Program,” the license renewal basis evaluation document, and VEGP-specific procedures that pertain to the design, details, and implementation of this AMP. As part of its review of these documents, the staff reviewed the “scope of program,” “preventative actions,” “parameters monitored/inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” and “operating experience” program element descriptions for the Oil Analysis Program, and information in supporting documents, and compared them to the corresponding program element criteria in GALL AMP XI.M39 in order to determine whether those program elements claimed as being consistent with GALL were consistent with the corresponding program element criteria in GALL AMP XI.M39. Based on its review, the staff verified that the program element aspects claimed as being consistent with GALL included all the program element criteria recommended in the corresponding program elements in GALL AMP XI.M39. Based on this review, the staff finds that these program element aspects of the Oil Analysis Program are acceptable because the staff has verified that they are consistent with the corresponding program elements in GALL AMP XI.M39.

The staff also reviewed the exceptions and enhancements to determine whether the AMP, as subject to the activities defined in the exceptions and enhancements will be adequate to manage the aging effects for which it is credited. The staff’s evaluation of the exception taken to GALL AMP XI.M39 and the applicant’s enhancements of the AMP are described in the subsections that follow.

<u>Exception</u>

Exception 1: The LRA section B.3.16 (amended letter dated March 20, 2008) states that the Oil Analysis Program includes the following exception to the “program scope,” “preventive actions,” “ parameters monitored/inspected,” “detection of aging effects,” ”monitoring and trending,” “acceptance criteria,” and “operating experience,” program elements in GALL AMP XI.M39, “Oil Analysis Program:

> The VEGP Oil Analysis Program includes hydraulic fluid in addition to lubricating oil. In accordance with manufacturers’ recommendations and good engineering practice, hydraulic fluid is sampled for particulates, water content, viscosity, and neutralization number. Since the hydraulic fluids in use at VEGP are inherently fire-resistant, flash point is not an appropriate analysis criteria and is not performed for hydraulic fluid. The standard and acceptance criteria used for hydraulic fluid are in accordance with manufacturers’ recommendations.

The staff noted that this exception is an augmentation of the applicant’s existing program to include hydraulic oil in the scope of the program. The staff finds the inclusion of components with the hydraulic fluid into the scope of the AMP represents an acceptable conservative augmentation of the AMP that goes beyond the GALL AMP XI.M39 recommendations and therefore is not an exception to the GALL AMP. The staff therefore determined that this exception to the “program scope,” “preventive actions,” “ parameters monitored/inspected,” “detection of aging effects,” ”monitoring and trending,” “acceptance criteria,” and “operating experience ,” program elements is acceptable.

In the applicant’s letter of March 20, 2008, the applicant amended the LRA to include an additional exception to the “parameters monitored/inspected “ and “acceptance criteria” program elements, as discussed below.

Exception 2: In the applicant’s letter of March 20, 2008, the applicant amended the LRA to include the following additional exception to the “parameters monitored/inspected “ and “acceptance criteria” program elements in GALL AMP XI.M39, “Oil Analysis Program:

> The VEGP Oil Analysis Program screens all lubricating oil samples for wear metal content. This wear metal content screening constitutes an exception to GALL in that the screening does not provide a particle count as described in ISO 4406. VEGP's experience with this wear metal content screening process indicates that the process is very sensitive to the presence of particulate contaminants and therefore is a reliable method to monitor and trend particulate contamination.

The staff noted in the “acceptance criteria” program element in GALL AMP XI.M39 only refers to Standard ISO 4406 as a one of many standards that may be used for particulate counting and that the GALL AMP in no means mandated this standard for implementation. The applicant has taken the position that any particulates in the lubricating oil or hydraulic fluid would consistent of metallic species and therefore has proposed to perform wear metal content screening as the basis assessing the lubricating oil and hydraulic fluid inventories for particulates. The staff noted that ISO 4406 categorizes particulates by number of particulates counted according to size in micrometers. Although the applicant program does not monitor for particulates by counting the number of particulates falling within particular size ranges, the applicant’s program does screen for particulates based on concentrations of particulates that are greater than 5 microns in size and propose appropriate corrective actions if the concentration of metallic wear particulate greater than 5 microns in size is exceed. The staff finds the applicant’s alternative for particulate counting to be acceptable because: (1) GALL AMP XI.M39 does not mandate ISO 4406 for use, and (2) like ISO 4406, the applicant’s basis is based on size and concentration, and (3) the applicant’s alternative proposes appropriate corrective actions if the limits on concentration are exceeded.

<u>Enhancements</u>:

Enhancement 1: The LRA section B.3.16, (amended letter dated March 20, 2008 identifies that the Oil Analysis Program include the following enhancement of the “parameters monitored/inspected,” “detection of aging effects,” ”monitoring and trending,” “acceptance criteria,” and “operating experience” program elements in GALL AMP XI.M39, “Oil Analysis Program:”

> An overall program procedure or guideline formalizing the sampling and analysis activities performed by this program will be issued.

In letter dated March 20, 2008, the applicant amended Commitment No.14, which reflects this enhancement to the Oil Analysis Program. The staff noted that in Commitment No.14 the applicant states the parameters (viscosity, relative level of oxidation, and flash point) that will be monitored; the methods in which they will be monitored and the corrective actions that will be taken if the analysis indicated monitored levels are exceeded.

The staff concludes that this enhancement is acceptable because when the enhancement is implemented, as described in Commitment No.14, the Oil Analysis Program elements will be consistent with GALL AMP XI.M39 program elements, including protocols for periodic sampling and analysis of lubricating oil and hydraulic fluid inventories.

Enhancement 2: The LRA section B.3.16 (amended vi, dated March 20, 2008) identifies that the Oil Analysis Program includes the following enhancement of the "parameters monitored/inspected" program element for the AMP:

> For the components in the scope of license renewal determination of the viscosity, relative level of oxidation, and flash point of lubricating oil samples will be required for components where the lubricating oil is changed based on its analyzed condition instead of being changed on a regular schedule regardless of condition. The relative level of oxidation of the lubricating oil will be monitored by analysis of the neutralization number or other appropriate parameter(s). Flash point monitoring will be performed for those components which have the potential for contamination of the lubricating oil with a light hydrocarbon such as fuel oil.

During the audit and review, the staff asked the applicant to clarify whether the intent of this enhancement and Commitment No. 14 is to invoke viscosity testing, neutralization number testing, and flash point testing for both oil that is replaced or replenished on a periodic basis and does not get replaced or replenished on a periodic basis or whether the intent of the enhancement is to invoke viscosity testing, neutralization number testing, and flash point testing only for oil that is replaced or replenished on a periodic basis. If the later intent is meant, provide your basis for not crediting these tests for lubricating oil that does not get replaced or replenished on a regular basis.

In its response, dated February 8, 2008 the applicant stated that the lubricating oil at VEGP presently falls into one of two following categories:

1) Oil that is replaced based on its analyzed condition;
2) Oil that is replaced on a regular schedule regardless of condition.

The applicant also stated:

> Oil that is replaced on a regular schedule will continue to be replaced on that schedule during the period of extended operation in accordance with the current requirements of the Oil Analysis Program (with the stipulation that the SNC fleet-wide Oil Analysis Program currently in development could make changes determined by identification of best practices).
>
> For oil that is changed based on its analyzed condition, the Oil Analysis Program is being enhanced to require viscosity testing, relative level of oxidation testing, and

flash point testing, which may or may not be presently performed for the various affected components included in the program.

The relative level of oxidation of the lubricating oil will be monitored by analysis of the neutralization number (also known as acid number or base number per the current version of ASTM D974) or other appropriate parameter(s), such as conductivity, which measure changes in the relative level of oxidation of the lubricating oil.

The evaluation of this element included an enhancement that the flash point would be determined for lubricating oil samples where the oil is changed based on analyzed condition instead of at regular intervals. SNC would like to clarify this enhancement in that the flash point of lubricating oil will be monitored for those components where the oil is changed based on analyzed condition instead of at regular intervals, and which have the potential for contamination of the lubricating oil with a light hydrocarbon such as fuel oil. Flash point monitoring can provide useful information regarding the condition of lubricating oil which could be diluted by a light hydrocarbon. For components where there is no potential for contamination of the lubricating oil with a light hydrocarbon, other analyses provide direct monitoring of the parameters relevant to the condition of the oil. In these cases flash point monitoring is superfluous.

The staff's evaluation of the applicant's proposed enhancement depends on two different categorizations of lubricating oil/hydraulic fluid oil. The first pertains to tests for lube oils and hydraulic fluid oils that are replaced on a regular basis. For lubricating and hydraulic fluid oils falling into this category, the staff noted that the applicant stated that the program when enhanced will perform viscosity testing, neutralization number testing, and flash point testing on the sample of oil taken from the oil inventories. The staff verified that this is consistent with the program element "Parameters Monitored/Inspected" of GALL AMP XI.M39, and based on this determination finds the applicant enhancement with respect to oils that are replaced on a regular basis to be acceptable. The second category pertains to lube oils and hydraulic fluid oils that are not replaced on a regular basis, but are replaced when the analysis indicates that there is a need for replacement. For oils, falling into this category, the applicant stated that, when the program is enhanced, the program will perform viscosity testing, relative level of oxidation testing, and flash point testing when the oil is changed. Based on both of these assessments of the applicant's Oil Analysis Program, the staff concludes that when the program is enhanced as described in the applicant's response and Commitment No. 14, this program will be consistent with GALL AMP XI.M39.

The staff verified that the applicant amended LRA Commitment No. 14, dated March 20, 2008 to clarify the above enhancement. The staff concludes that this enhancement is acceptable because when the enhancement is implemented, Oil Analysis Program element "parameters monitored/inspected," will be consistent with GALL AMP XI.M39 program element "parameters monitored/inspected."

Enhancement 3: The LRA section B.3.16 identifies that the Oil Analysis Program include the following enhancement of the "parameters monitored/inspected," program element in GALL AMP XI.M39, "Oil Analysis Program: "

> Analytical ferrography or elemental analysis to identify wear particles or corrosion products when a lubricating oil sample's particles count exceeds established limits or action levels will be required for the components in the scope of license renewal.

The staff asked the applicant to provide the basis why the implementation of ferrography and elemental analysis will be implemented only if of the particulate counts from the particulate testing exceeds the acceptance criteria limits for particulate count.

In its response, the applicant stated the following:

> VEGP currently screens all lubricating oil samples for kinematic viscosity, water content and wear metal content. This applies both to components with periodic lubricating oil changes and to components where the lubricating oil is changed based on analyzed condition.
>
> The wear metal content screening provides a relative measure of the change in the amount of ferrous wear products in the lubricating oil sample versus a baseline sample. The ferrous wear index measures the concentration and size of ferrous particles greater than five microns in size. The value is reported as a non-dimensional value (no units of measurement). Comparison of subsequent lubricating oil sample results to the baseline sample provides the ability to trend changes in the concentration of ferrous wear products in the lubricating oil.
>
> Elemental analysis and neutralization number testing are also performed for certain components in the scope of license renewal where the lubricating oil is changed based on analyzed condition instead of at regular intervals. Components selected for these analyses are selected based on EPRI guidelines, manufacturer's recommended testing and radiological shipping requirements.
>
> For both components with periodic lubricating oil changes and components where the lubricating oil is changed based on analyzed condition, if a lubricating oil sample exceeds the limits established for the wear metal content screening, the lubricating oil from that component will be subjected to additional testing. The additional testing may include detailed particle counting, elemental analysis, or analytical ferrography as necessary to validate the initial screening results and to diagnose the source of the particulates.
>
> The wear metal content screening process described above constitutes an exception to GALL AMP in that the screening does not provide a particle count as described in ISO 4406. VEGP's experience with this wear metal content screening process indicates that the process is very sensitive to the presence of particulate contaminants and therefore is a reliable method to monitor and trend particulate contamination. The applicant states that it will require a License Renewal Application amendment to document this exception.

> Phosphate ester hydraulic fluid is tested in accordance with manufacturer's recommendations. This fluid is sampled for viscosity, acidity (neutralization number), particle count and water content. For phosphate ester hydraulic fluids, elemental analysis and analytical ferrography are not components of the manufacturer's recommended testing and therefore are not routinely performed. Elemental analysis and analytical ferrography may be performed if deemed necessary to assist in diagnosing potential problems indicated by the manufacturers recommended testing.

The staff noted that enhancement required testing for both oil that is changed based on analytical results or for oil that is periodically changed on a specified schedule. The staff noted that the applicant's testing for wear metal particles accomplishes two purposes: initial screening for particulates and trending in order to determine whether additional analytical testing by ferrography needs to be performed on samples taken from the oil inventory. The staff verified that the applicant amended the LRA and incorporated this enhancement into the LRA, Commitment No. 14, in its letter dated March 20, 2008, to clarify the above enhancement and the enhancement is scheduled for implementation prior to the period of extended operation. The staff finds that this enhancement is acceptable because when the enhancement is implemented, Oil Analysis Program element "parameters monitored/inspected," will achieve the objectives of the tests recommended in program element "parameters monitored/inspected" program element in GALL AMP XI.M39, because the process would provide the applicant the ability to trend changes in the concentration of particulates and ferrous wear products in the lubricating oil and hydraulic fluid. Based on this review, the staff finds this enhancement of the program to be acceptable.

<u>Operating Experience</u> LRA Section B.3.16 states that operating experience with the Oil Analysis Program shows that it has prevented component failures due to oil contamination or degradation effectively. The LRA section states that the program has detected lubricating oil and hydraulic fluid samples with water or particulate contamination in excess of established limits and that corrective actions have been in accordance with the Corrective Action Program. The LRA section states that here have been no component failures attributed to lubricating oil or hydraulic fluid contamination or degradation.

The staff reviewed the above operating experience including the applicant's operating experience evaluations and interviewed the applicant's technical staff and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff also reviewed the VEGP operating experience reports and a sample of condition reports and maintenance work orders associated with the corrective actions taken for the identification of signs of degradation of oil from plant components. The staff confirmed that the condition reports were closed out by repairs or performed adequate engineering evaluations for their acceptability.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.16, the applicant provided the UFSAR supplement for the Oil Analysis Program. The staff reviewed the applicant's license renewal commitment list dated June 27, 2007, and confirmed that the implementation of the Oil

Analysis Program enhancements are identified as Commitment No.14, to be implemented before the period of extended operation. The staff reviewed UFSAR Supplement 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 concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and its 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 Report 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).

3.0.3.2.11 One-Time Inspection Program for ASME Class 1 Small Bore Piping

Summary of Technical Information in the Application LRA Section B.3.18 describes the new One-Time Inspection Program for ASME Class 1 Small Bore Piping as consistent, with exceptions, with GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping."

The applicant stated that the One-Time Inspection Program for ASME Class 1 Small Bore Piping addresses staff concerns on potential cracking of Class 1 piping with a diameter less than NPS 4. As stated in GALL Report Section XI.M35, the staff believes a one-time inspection program of ASME Code Class 1 Piping less than NPS 4 is necessary to detect SCC and cracking from thermal and mechanical loading.

The applicant also stated that volumetric examination of a sample population of ASME Code Class 1 piping butt welds less than NPS 4 will address SCC concerns. Selection of examination locations will use a risk-based approach considering susceptibility, inspectability, dose, and operating experience.

To address unanticipated thermal fatigue cracking of ASME Code Class 1 piping less than NPS 4, VEGP will screen and evaluate pipe lines using Materials Reliability Program (MRP)-146, "Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines," or later updated guidance. There will be small-bore piping inspections to detect thermal fatigue only at piping locations that fail screening and are not monitored for thermal cycling.

The applicant further stated that program examinations may be incorporated into a staff-approved risk-informed inservice inspection program. The inspections will be within the ten years preceding the period of extended operation.

VEGP will not examine socket welds volumetrically. Currently, a reliable and effective volumetric examination to detect cracking in socket welds is not available. There are Inservice Inspection (ISI) Program VT-2 visual examinations of ASME Class 1 piping socket welds at each refueling outage.

Staff Evaluation During its audit and review, the staff confirmed 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 One-Time Inspection Program for ASME Code Class 1 Small-Bore Piping for which the applicant claims consistency with GALL AMP XI.M35 and found that they are consistent with the GALL Report AMP. Furthermore, the staff concludes that the applicant's One-Time Inspection Program for ASME Code Class 1 Small-Bore Piping will properly manage the aging of ASME Code Class 1 small bore piping for the period of extended operation. The staff finds the applicant's One-Time Inspection Program for ASME Code Class 1 Small-Bore Piping acceptable because it conforms to the recommended GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping," with the exceptions as described below.

Exception 1. The LRA states an exception to the following GALL Report program element:

Element: 5: monitoring and trending

Exception: GALL AMP XI.M35 specifies volumetric examination to detect cracking due to thermal fatigue. VEGP will screen and evaluate pipe lines using MRP-146, or later updated guidance. Inspections of small bore piping to detect thermal fatigue will be performed only at piping locations that fail the screening and are not monitored for thermal cycling.

The staff finds this exception acceptable because the applicant has committed to use the latest industry guidance to screen for those pipe locations that are potentially susceptible to cracking due to thermal fatigue and should be inspected. The locations selected for inspection are those that are not screened out or for which thermal monitoring are not performed. The resulting locations are inspected under the applicant's Inservice Inspection (ISI) Program.

During the audit and review, the staff noted that the VEGP program will not specifically perform volumetric examinations of the socket welds, but instead credits periodic VT-2 visual examinations of the ASME Code Class 1 piping socket welds under the VEGP Inservice Inspection Program. The staff asked the applicant to provide the basis as to how a VT-2 visual examination, in of itself, can assure the integrity of the small bore ASME Class 1 socket welds in lieu of conforming to the GALL Report recommendation. In addition the applicant was asked to provide the basis for why the surface examination requirements for small bore socket welds in ASME Section XI Examination Categories B-F and B-J should not be credited in addition to the VT-2 visual examinations required under Examination Category B-P.

In its response, the applicant stated that the issue of volumetric examination of ASME Class 1 socket welds was recently resolved and included in the NRC's summary dated March 6, 2007 of the license renewal telephone conference call and meeting between the NRC staff and the License Renewal Task Force held on February 21, 2007 (ADAMS Accession No. ML070580498).

In the summary, the staff presented its position on small bore socket welds. The GALL AMP, “One-Time Inspection of ASME Class 1 Small Bore Piping,” does not mention socket welds. ASME Section XI, ISB-2500, Category B-J requires a surface examination for small bore socket welds larger than one inch in diameter. The industry proposed a substitution of VT-2 examinations in place of the code required surface examination or volumetric examination of socket welds. ASME Code Case N-587-1 permits VT-2 examination of socket welds in place of the code required surface examination during each refueling outage for several reasons. There are no qualified, volumetric examinations for socket welds. Industry experience has shown that cracks in socket welds normally initiate from the inside surface of the socket welds and surface examination is ineffective in detecting the presence of these cracks until they become through wall cracks. Once the cracks become through wall, a VT-2 examination is effective in detecting the associated leakage. The staff agreed that VT-2 examinations of socket welds are acceptable.

Exception 2. The LRA states an exception to the following GALL Report program element:

Exception: 6: acceptance criteria

Exception: Acceptance criteria at the time of inspection will be based on the plant-specific VEGP Inservice Inspection Program in conformance with 10 CFR 50.55a. GALL AMP XI.M35 specifies acceptance criteria from ASME Section XI, 2001 Edition with 2002 and 2003 Addenda.

During the audit and review, the staff noted that the VEGP Inservice Inspection Program second inspection interval ended in May 2007. The staff further noted that the VEGP third inservice inspection interval requirements are based on ASME Section XI, 2001 Edition including the 2002 and 2003 Addenda which are consistent with the GALL Report recommendations. The staff asked the applicant to clarify its position in regard to the above exception. The applicant responded that the LRA will be amended to delete this exception and to revise the program description to state that the current ASME code edition is the 2001 Edition with the 2002 and 2003 Addenda. The staff finds this response acceptable because the program will be consistent with the GALL Report recommendations. Furthermore, the staff confirmed that the applicant revised the LRA in a letter dated August 11, 2008 (LRA Amendment No. 3).

Under the “monitoring and trending” program element, GALL AMP B.3.18, “One-Time Inspection Program for ASME Class 1 Small Bore Piping,” recommends that the number of inspection locations, or sample size, be based on susceptibility, inspectability, dose considerations, operating experience, and limiting locations of the total population of ASME Code Class 1 small-bore piping locations. However, LRA Section B.3.18 states that the examination locations will be selected using a risk-based approach that will consider the susceptibility, inspectability, dose, and operating experience. During the audit and review, the staff asked the applicant to explain how risk is to be used in selecting the examination locations and how a representative sample size for aging management is to be established. In its response, the applicant stated that risk is incorporated into the selection of examination locations in that the VEGP One-Time Inspection Program for ASME Class 1 Piping required for license renewal is implemented at VEGP using the framework of the VEGP Risk-Informed ISI (RI-ISI) Program. Under the RI-ISI program, ASME Class 1 piping was broken out into segments based on size of the piping and the consequence of failure.

Failure probabilities were calculated for each segment considering failure mechanisms such as thermal stratification and mixing, vibration, stress corrosion cracking, mechanical loading, thermal loading, and transient loading. Consequence of failure and failure probabilities were then integrated to determine the highly safety significant (HSS) segments to be examined. By definition, these piping segments carry a higher risk of failure and a higher risk of significant consequences if failure occurs. The applicant further stated that operating experience at Vogtle and other operating nuclear plants was factored into the evaluation through the use of an expert panel. A statistical model was used to select the minimum number of locations to be examined within each HSS segment to ensure that an acceptable level of piping reliability will be maintained. For each piping segment, the results of the statistical model must show that the number of weld locations selected for inspection results in a confidence level equal to or greater than 95 percent that current safety margins and the integrity of the piping segment will be maintained. The staff finds this acceptable because the selection process provides an inspection sample that provides a 95 percent confidence level that the current safety margins will be maintained and piping reliability maintained.

Operating Experience LRA Section B.3.18 states that there is no programmatic operating experience specifically applicable to this new program but that the selection of the component sample set will consider plant-specific and industry operating experience. Screening, evaluation, and inspection of piping locations for thermal fatigue will be based on industry guidance that incorporates operating experience and research data.

The applicant stated that VEGP experienced leakage in small-bore residual heat removal (RHR) bypass lines due to inadequate design. Four leakage events occurred on an RHR loop suction valve bypass line between December 2005 and March 2006, resulting in nonisolable RCS pressure boundary leakage. There had been no through-wall leakage in the bypass line since original construction and start-up 16 years earlier.

The ¾-inch diameter bypass line was part of the original design. Its purpose is to relieve pressure between the two RHR loop suction isolation gate valves. In 2002, a modification used this original line to relieve excess pressure in the valve bonnet and between the valve disks back towards the RCS. The first leak in December 2005 was at one of the 2002 modification welds.

The applicant further stated that an extensive evaluation to determine the cause of the leaks found the RHR pipe from the RCS nozzle to the closed valve pulsing from acoustic vibration caused by RCS flow past the nozzle causing vortex shedding based on flow rate and nozzle size. Energy from the vortex shedding drives the acoustic vibration of the RHR pipe. Because the bypass line was not axially restrained, resonance from the vortex shedding and other factors caused the RHR piping to vibrate with sufficient force to increase stress at the break locations above the endurance limit of the material, resulting in fatigue cracks.

The applicant removed the bypass line and leak-off lines on Unit 2, Loop 1, where the leakage occurred and installed temporary accelerometers on both Unit 2 bypass lines currently monitored. So far the vibration levels remain acceptable. From the results of the evaluation, the applicant determined that the problem is design-related and not an AERM.

During the on-site audit, the staff confirmed that VEGP has ongoing programs to monitor industry and site specific operating experience. These programs include mechanisms to update or modify plant procedures or practices to incorporate lessons learned. Furthermore, the staff confirmed that there were no aging related degradation failures in the Vogtle small bore piping. On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the staff finds that the applicant's One-Time Inspection Program for ASME Code Class 1 Small Bore Piping when implemented will adequately manage the aging effects for which the AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.18, the applicant provided the UFSAR supplement for the One-Time Inspection Program for ASME Class 1 Small Bore Piping. The staff reviewed the applicant's license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that this program is identified as Commitment No. 16 to be implemented before the period of extended operation. The staff reviewed LRA Section A.2.18 and determined 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 One-Time Inspection Program for ASME Class 1 Small Bore Piping, the staff finds, with the implementation of Commitment No. 16, 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 One-Time Inspection Program for Selective Leaching

Summary of Technical Information in the Application LRA Section B.3.19 describes the new One-Time Inspection Program for Selective Leaching as consistent, with exception, with GALL AMP XI.M33, "Selective Leaching of Materials."

The applicant stated that the One-Time Inspection Program for Selective Leaching assesses selective leaching in susceptible cast iron and copper alloy components. The program includes a one-time examination of a sample population of components most likely to exhibit selective leaching. If initial examinations to be completed prior to the period of extended operation find degradation due to selective leaching there will be additional examinations.

Examination techniques may include hardness measurement (where feasible based on form and configuration), visual examination, metallurgical evaluation, or other techniques proven effective in detecting and assessing the extent of selective leaching. The inspections will be within the ten years preceding the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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.

During the audit, the staff interviewed the applicant's technical staff and reviewed documents related to the One-Time Inspection Program for Selective Leaching, including the license renewal basis document in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M33. The staff finds for those portions of the program for which the applicant claims consistency with the GALL Report AMP that they are consistent. Furthermore, the staff concludes that the applicant's One-Time Inspection Program for Selective Leaching will properly manage the selective leaching of susceptible cast iron and copper alloy components for the period of extended operation. The staff finds the applicant's One-Time Inspection Program for Selective Leaching acceptable because it conforms to the recommended GALL AMP XI.M33, "Selective Leaching of Materials," with the exception as described below.

The LRA states an exception to the following GALL Report program element:

Element:	4: detection of aging effects
Exception:	GALL AMP XI.M33 specifies visual inspection and hardness measurement to detect selective leaching. The VEGP Selective Leaching Program may use other detection techniques instead of, or in addition to, visual examination and hardness measurement. For some component locations, visual examination and hardness measurement may not be feasible due to geometry and configuration issues. Additionally, other examination methods may be shown to be equally effective in detecting and assessing the extent of selective leaching.

During the audit and review, the staff reviewed the exception with the applicant to clarify the use of the proposed alternate examination techniques that may be used to detect selective leaching in some materials and their configurations. The staff finds this exception acceptable because the alternate techniques are capable of detecting the presence of selective leaching and are being used in addition to visual inspections as recommended by the GALL Report. Therefore, the program will address the recommendations of the GALL Report and be consistent with the "detection of aging effects" program element.

Operating Experience LRA Section B.3.19 states that operating experience for license renewal shows no incidents of selective leaching. There is no programmatic operating experience for the new one-time inspections for selective leaching but the selection of the initial component sample set will consider plant-specific and industry operating experience.

During the audit and review, the staff reviewed the program documents that explained how operating experience is captured. The program documents state that a condition report will be prepared documenting the results of the inspections, which will include a detailed description of the visual examination and hardness testing locations. Additionally, the documents state that if any conditions are observed which do not meet the acceptance criteria, then appropriate actions will be taken to prevent the component from being returned to service until required corrective actions have been completed. The documents further state that the applicant's Engineering Support group will evaluate the inspection results for operability, component life, repair options, or other corrective actions as appropriate. The staff's finds that this monitoring assessment and corrective action is acceptable.

On the basis of its review and discussions with the applicant's technical staff, the staff finds that the applicant's One-Time Inspection Program for Selective Leaching, when implemented, will adequately manage the aging effects for which the AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10.

The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.19, the applicant provided the UFSAR supplement for the One-Time Inspection Program for Selective Leaching. The staff reviewed the applicant's license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that this program is identified as Commitment No. 17 to be implemented before the period of extended operation. 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 One-Time Inspection Program for Selective Leaching, the staff finds, with the implementation of Commitment No. 17, that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and its justification 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Piping and Duct Internal Inspection Program

Summary of Technical Information in the Application LRA Section B.3.22 describes the new Piping and Duct Internal Inspection Program as consistent, with exceptions, with GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

The applicant stated that the Piping and Duct Inspection Program manages corrosion of steel, stainless steel, and copper alloy components and degradation of elastomer components due to changes in material properties. Components included in the scope of this program are not addressed by other AMPs. Inspections normally will be concurrent with scheduled preventive maintenance, surveillance testing, and corrective maintenance. Specific examinations not coordinated with scheduled work activities also may proceed at the discretion of the program owner. Inspection locations and intervals will be dependent on the likelihood of significant degradation and on current industry and plant-specific operating experience.

The applicant also stated that examination techniques will be appropriate to detect and assess the aging mechanism of concern and may include visual examination and non visual nondestructive examination (*e.g.*, ultrasonic testing or radiography, physical manipulation of elastomers, etc). The new Piping and Duct Internal Inspection Program will be implemented prior to the period of extended operation.

<u>Staff Evaluation</u> During its audit and review, the staff confirmed 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 also reviewed the information in the VEGP Piping and Duct Internal Inspection Program, the license renewal (LR) basis evaluation document, and VEGP-specific procedures that pertain to the design, details, and implementation of this AMP.

The staff noted that the applicant identifies the Piping and Duct Internal Inspection Program as a new AMP that is designed to be consistent with the program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components" with exceptions.

The staff concludes from its review of the LR basis evaluation document that the program elements for the "Piping and Duct Internal Inspection Program" were all consistent with the program element criteria recommended in GALL AMP XI.M38 with the following four exceptions. The staff's evaluation on how these exceptions provide for adequate aging management is described in the following section.

<u>Exceptions</u>:

Exception 1: The LRA section B.3.22 identifies that the Piping and Duct Internal Inspection Program includes the following exception to the "scope of program", program element in GALL AMP XI.M38:

> The program scope described in NUREG-1801, Section XI.M38 includes only steel piping, piping components, ducting, and other components. The VEGP Piping and Duct Internal Inspection Program also includes stainless steel, copper alloy and elastomer components."

The staff noted that this exception is an augmentation of the applicant's new program to include stainless steel, copper alloy and elastomer components in the scope of the program. Stainless steel materials are designed to be corrosion resistant in an uncontrolled air environment. Copper alloy materials typically develop copper oxide surface layer in an air environment that protects the alloy from further corrosion. Since these materials have innate corrosion resistance, the staff finds the inclusion of stainless steel and copper alloy within the scope of this AMP is conservative and acceptable. The staff finds the inclusion of components with the stainless steel, copper alloy, and represents an augmentation of the AMP that exceeds the recommended program criteria in the GALL AMP XI.M38.

The staff questioned the applicant on extending this AMP to elastomeric components, and with simply using visual examination methods to manage cracking or changes in the material properties for these materials. In RAI 3.3-1/3.4-1, the staff asked the applicant to justify its basis for crediting the AMP to manage cracking or changes that might occur in the material properties in the type of materials for AMPs that credit visual examinations of external polymer (including thermo, thermo set, elastomer or rubber) surfaces,. The staff also asked the applicant to clarify how a visual examination alone would be capable of detecting cracking or a change in specific material properties for these types of materials.

By letter dated July 17, 2008, the applicant provided its response to RAI 3.3-1 and 3.4-1. In its response, the applicant stated that this AMP does not, "only credit visual examinations to detect cracking and changes in material properties of polymers." The applicant further stated that visual examinations will be performed to detect discontinuities and imperfections on the surface of the component, and non-visual examinations such as tactile techniques, which include scratching, bending folding, stretching and pressing, will be performed in conjunction with the visual examinations.

The staff noted that VEGP is crediting both visual examinations and tactile techniques to detect for cracking and change in material properties for elastomers and polymers. The staff further noted that the applicant described the specific tactile techniques that may be used in conjunction with the visual examine. The staff noted that these techniques include scratching the material surface to screen for residues that may indicate a breakdown of the polymer material, bending or folding of the component which may indicate surface cracking, stretching to evaluate resistance of the polymer material and pressing on the material to evaluate the resiliency. Based on its review of the applicant's response, the staff finds it acceptable because the applicant has indicated that VEGP is not crediting visual examinations alone to detect cracking and change in material properties for elastomers and polymers, and that VEGP has credited tactile techniques, as described above, as well to detect for such aging effects as cracking and change in material properties.

Based on this review, the staff finds that this exception to the "scope of program", program elements in the GALL AMP XI.M38 is acceptable because the added component types within the scope of the applicant's AMP have adequate detection and mitigative actions to detect the aging effects of external polymer surfaces. In addition the staff reviewed the exception and its justification and determines that the AMP with the exception is adequate to manage the aging effects for which it is credited.

Exception 2: The LRA section B.3.22 identifies that the Piping and Duct Internal Inspection Program includes the following exception to the "parameters monitored/inspected," program element in GALL AMP XI.M38:

> The VEGP Piping and Duct Inspection Program will monitor not only Component surfaces through visual examination, but may also use non-visual techniques to monitor parameters such as wall thickness and ductility.

The staff noted that this exception is an augmentation of the applicant's new program to include monitoring, not only component surfaces through visual examination and non – visual examination, but may also monitor parameters such as wall thickness and ductility.

The staff finds the inclusion of monitoring the parameters such as wall thickness and ductility represents an acceptable augmentation of the AMP that goes beyond the recommended program criteria in the GALL AMP XI.M38. The inclusion of monitoring parameters such as wall thickness and ductility will enable the program to monitor the changes such as effects of erosion in Piping and Duct Internal materials.

Based on this review, the staff finds that this exception to the "Parameters Monitored/Inspected," program element in GALL AMP XI.M38 is an augmentation of the program Element and determines that the AMP with the exception is adequate to manage the aging effects for which it is credited. Therefore, this exception is acceptable.

Exception 3: The LRA section B.3.22 identifies that the Piping and Duct Internal Inspection Program includes the following exception to the "detection of aging effects," and "monitoring and trending," program elements in GALL AMP XI.M38:

> The VEGP Piping and Duct Internal Inspection Program may use other detection techniques instead of, or in addition to, visual examination. For some materials or component locations, visual examination may not be the most appropriate inspection technique or may not be feasible due to geometric or other limitations. This difference is justified because other examination methods can be shown to be equally effective in detecting and assessing degradation. The VEGP Piping and Duct Inspection Program will monitor not only component surfaces through visual examination, but may also use non-visual techniques to monitor parameters such as wall thickness and ductility.

The staff noted that this exception is an augmentation of applicant's new program to include monitoring not only component surfaces through visual examination, but may also use non-visual techniques to monitor parameters such as wall thickness and ductility. The staff finds the inclusion of monitoring not only component surfaces through visual examination, but also the use of non-visual techniques to monitor parameters, such as wall thickness and ductility in the scope of the AMP represents an acceptable augmentation of the AMP that goes beyond the recommended program criteria in the GALL AMP XI.M38. The staff finds that the applicant has proposed to implement the AMP in a manner that will provide added assurance to manage and detect the age related degradation in this new Piping and Duct Internal Inspection Program.

In RAI 3.3-1/3.4-1, the staff sought additional clarification on how visual examination methods alone would be capable of detecting cracking or change in material properties for elastomer/polymer components that are within the scope of this AMP. This applicant's response to RAI # 3.3-1 and 3.4-1 is relevant to whether the inspection techniques credited under this AMP, including those supplemental techniques addressed in the exception 3, are capable of managing loss of material, cracking, or material property changes in polymer/elastomer components.

By letter dated July 17, 2008, the applicant provided its response to RAI 3.3-1 and 3.4-1. In its response, the applicant stated that this AMP does not, "only credit visual examinations to detect cracking and changes in material properties of polymers." The applicant further stated that visual examinations will be performed to detect discontinuities and imperfections on the surface of the component, and non-visual examinations such as tactile techniques, which include scratching, bending folding, stretching and pressing will be performed in conjunction with the visual examines.

The staff noted that VEGP is crediting both visual examinations and tactile techniques to detect for cracking and change in material properties for elastomers and polymers. The staff further noted that the applicant described the specific tactile techniques that may be used in conjunction with the visual examination. The staff noted that these techniques include scratching the material surface to screen for residues that may indicate a breakdown of the polymer material, bending or folding of the component which may indicate surface cracking, stretching to evaluate resistance of the polymer material and pressing on the material to evaluate the resiliency. Based on its review of the applicant's response, the staff finds it acceptable because the applicant has indicated that VEGP is not crediting visual examinations alone to detect cracking and change in material properties for elastomers and polymers, and that VEGP has credited tactile techniques, as described above, as well to detect for such aging effects as cracking and change in material properties.

Based on this review, the staff finds that this exception to the "detection of aging effects," and "monitoring and trending," program element in the GALL AMP XI.M38 is acceptable because tactile techniques were added to the program to detect cracking and changes in material properties of polymers/elastomer components. In addition, the staff reviewed the exception and its justification and determines that the AMP with the exception is adequate to manage the aging effects for which it is credited. The exception therefore is acceptable.

Exception 4: The LRA section B.3.22 identifies that the Piping and Duct Internal Inspection Program includes the following exception to the "acceptance criteria," program element in GALL AMP XI.M38:

> The VEGP Piping and Duct Internal Inspection Program will include Acceptance criteria for both visual and non-visual techniques. Acceptance criteria will be defined in program procedures. For physical manipulation or destructive examination of elastomers, no indication of unacceptable hardening, de-lamination, or cracking of the elastomer is acceptable.
>
> For thickness measurements of steel, stainless steel, and copper alloy components, remaining wall thickness must be sufficient to provide reasonable assurance that the component will continue to perform its component function until the next scheduled inspection.

The applicant's inclusion in this exception to include "Acceptance Criteria" for both visual and non-visual techniques will augment this AMP with exception to adequately manage the aging effects for which it is credited.

The staff noted that the applicant's inclusion of the both visual and non-visual techniques required the acceptance criteria to be expanded so that it included relevant updates to implementing procedures with the proper acceptance criteria for the additional non-visual inspection techniques. On the basis of its review, the staff has determined this exception is acceptable because the applicant has included an expansion of its acceptance criteria and will provide updates to the implementing procedures for this program to reflect the additional non-visual inspection techniques that this program will use to manage the aging effects with in the scope of this program.

The staff also noted that the applicant has included the need for initiating and conducting its implementation of this AMP in LRA Commitment No.19, letter dated March 20, 2008

The staff finds that the applicant has proposed to implement the AMP in a manner that will provide adequate management and detection of the age related degradation in this new Piping and Duct Internal Inspection Program. In addition the staff reviewed the exception and its justification and determines that the AMP with the exception is adequate to manage the aging effects for which it is credited. Therefore, this exception is acceptable.

Operating Experience LRA Section B.3.22 states that there is no specific programmatic operating experience for this new program because it is a new program and it has not been implemented yet. The applicant indicated that the selection of inspection locations, inspection intervals, and prescriptions of appropriate inspection techniques will consider plant-specific and industry operating experience. Because this is a new program, by letter dated March 20, 2008, the applicant committed (Commitment No.19) to initiating and implementing the Piping and Duct Internal Inspection Program prior to the period of extended operation.

During the staff audit, the staff discussed the aspect of new AMPs with the plant personnel; the applicant stated that there is no programmatic operating experience specifically applicable to this new program. However, the results of existing maintenance inspections are relevant to this program. Degradation of components identified during a maintenance inspection is required to be documented in a Condition report (CR). The review of VEGP operating experience identified a small number of CR's which have been submitted for degradation of internal surface of the components in the scope of this program. No occurrence of aging of internal surfaces of a component exposed to an air environment was identified. Some degradation of the internal surfaces of carbon steel components exposed to raw water environment was been identified. The Piping and Duct Internal Inspection Program will manage aging of internal surfaces of components in the scope of this program during the period of extended operation. Plant and industry operating experience will be considered in selecting Inspection locations determining inspection intervals, and prescribing appropriate inspection techniques.

The staff noted the inspection techniques and nondestructive examination techniques are well proven in the industry and have been demonstrably effective in detecting degradation. Inspections of internal surfaces during maintenance have the material condition of plant

The program is based on the GALL Report program based in turn on industry operating experience. The plant does not have plant-specific operating experience consistent with the operating experience described in the GALL AMP.

During the audit and review, the staff reviewed the operating experience discussed in the LRA and in the basis document for the Piping and Duct Internal Inspection Program. In addition, the staff reviewed a sample of condition reports for degraded piping and duct components. The staff finds that the review of the operating experience documented in the LRA and basis document for the Piping and Duct Internal Inspection Program did not reveal any unusual or significant findings.

The staff also finds that the applicant did not identify any age-related related issues not bounded by the industry operating experience.

The staff also noted when the above aspects of Exception # 4 of this program
(1) Operating experience is documented (2) RAIs # 3.3-1 and #.3.4-1 are resolved and accepted (3) LRA Commitment No.19, as described in the response letter dated March 20, 2008, is fully implemented, the program bounds operating experience that may occur in the future and the program will be capable of managing the aging effect during the period of extended operation.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement The staff reviewed the UFSAR Supplement summary description that was provided in LRA Section A.2.22 for the Piping and Duct Internal Inspection Program. The staff verified that, in LRA Commitment No. 19 in the applicant’s response letter dated March 20, 2008, the applicant committed to implement the Piping and Duct Internal Inspection Program prior to the period of extended operation. The staff also verified that the applicant has placed this commitment on UFSAR Supplement summary description A.2.22 for Piping and Duct Internal Inspection Program.

Based on this review, the staff finds that UFSAR Supplement Section A.2.22 provides an acceptable UFSAR Supplement summary description of the applicant’s Piping and Duct Internal Inspection Program, which uses appropriate examination techniques on locations likely to have significant degradation in materials such as steel, stainless steel, copper and elastomer components, and will be implemented as committed to in LRA Commitment No. 19. Therefore, the staff concludes that the UFSAR supplement for this AMP provides an adequate summary description of the program, as described by 10 CFR 54.21(d).

Conclusion On the basis of its audit and review of the applicant’s Piping and Duct Internal Inspection Program, the staff concludes 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Reactor Vessel Closure Head Stud Program

Summary of Technical Information in the Application LRA Section B.3.23 describes the existing Reactor Vessel Closure Head Stud Program as consistent, with exceptions, with GALL AMP XI.M3, “Reactor Head Closure Studs.”

The applicant stated that the Reactor Vessel Closure Head Stud Program has preventive measures as described in Regulatory Guide 1.65 and Inservice Inspection (ISI) programs to manage loss of material and cracking in the reactor vessel closure head studs, nuts, and washers.

The applicant also stated that preventive measures include material controls and the use of approved lubricants. Reactor vessel head studs are fabricated from modified SA-540 Grade B24 material as specified in ASME Boiler and Pressure Vessel Code Case 1605. This code case is not specified in Regulatory Guide 1.65 but is approved by Regulatory Guide 1.85. Actual stud material properties have ultimate tensile strengths less than 170 ksi. Each reassembly lubricates the reactor vessel closure head studs and nuts with an approved, stable lubricant.

The applicant further stated that condition monitoring includes visual and volumetric examinations and leakage detection consistent with the ISI Program. These inspections are in accordance with 10 CFR 50.55(a), which imposes the ISI requirements of ASME Code Section XI for Classes 1, 2, and 3 pressure-retaining components and their attachments.

The ISI Program second inspection interval ended in May 2007. The third ISI interval requirements are based on ASME Code Section XI, 2001 Edition and 2002 and 2003 Addenda.

<u>Staff Evaluation</u> During its audit and review, the staff confirmed 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.

During the audit, the staff interviewed the applicant's technical staff and reviewed documents related to the Reactor Head Closure Studs Program, as listed in the audit summary, including the license renewal program basis document in which the applicant assessed whether the program elements, with the exceptions described below, are consistent with GALL AMP XI.M3.

On the basis of its review, the staff concludes that the VEGP Reactor Vessel Closure Head Stud Program includes preventive measures and condition monitoring examinations to adequately manage loss of material and cracking in the reactor vessel closure head studs, nuts, and washers during the extended period of operation. The staff finds LRA B.3.23 program elements, with the exception described below, consistent with the GALL AMP XI.M3.

<u>Exception</u> In the LRA, the applicant identified two exceptions to the GALL AMP XI.M3 program elements.

Exception (1)- The LRA B.3.23 states an exception to the following GALL Report program elements:

Elements 3: Parameters Monitored/Inspected
4: Detection of Aging Effects
5: Monitoring and Trending
6: Acceptance Criteria

Exception NUREG-1801, Section XI.M3, describes the program as conforming to the requirements of ASME Section XI, 2001 Edition including the 2002 and 2003 Addenda. However, 10 CFR 50.55a governs the application of Codes and Standards. While the VEGP Inservice Inspection Program for the 3rd inspection interval will use the 2001 Edition including the 2002 and 2003 Addenda, the program will be updated in conformance with 10 CFR 50.55a for future inspection intervals.

Additionally, volumetric examinations are in compliance with the performance demonstration initiative. This initiative program is currently based on Appendix VIII, 2001 Edition of Section XI as mandated by 10 CFR 50.55a.

These differences are considered to be an exception to NUREG-1801, Rev. 1 Section XI.M3.

Exception (2)- The LRA B.3.23 states an exception to the following GALL Report program elements:

Elements 4: Detection of Aging Effects

Exception The program described in NUREG-1801, Rev. 1, Section XI.M3 includes visual, surface, and volumetric examinations. The VEGP 3rd inservice inspection interval requirements will be based on ASME Section XI, 2001 Edition including the 2002 and 2003 Addenda. This edition of the ASME Code does not require surface examinations and the VEGP program will not include surface examination of the reactor vessel closure head studs unless required by a future Code Edition specified in 10 CFR 50.55a

The staff noted that the first exception in LRA AMP B.3.23, “Reactor Vessel Closure Head Stud Program,” for program elements 3, 4, 5, and 6 states that VEGP Inservice Inspection Program for the 3rd inspection interval will use the 2001 Edition, inclusive of 2002 and 2003 Addenda. However, the ASME Code Section XI Edition 2001, including the 2002 and 2003 Addenda, is also referenced in GALL AMP XI.M3. The staff recognized that the applicant had used a similar approach for identifying exceptions to several LRA aging management program. During the audit and review, the staff asked the applicant to explain why the relevant statement on the ASME Code edition for the LRA AMPs is considered to be an exception to GALL AMPs, or clarify if the LRA needs to be amended to delete this exception based on the staff’s determination.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. The applicant in its response stated that VEGP understands it is the staff's interpretation that use of later Editions of ASME Section XI than the edition specified in the GALL Report, Revision 1, for future inspection intervals is not an exception to the GALL Report, provided the Edition of ASME Section XI currently used is the same Edition referenced in the GALL Report, Revision 1. As a result, the applicant in its letter dated

March 20, 2008 amended the LRA Section B.3.23 to remove this exception. In addition, the applicant revised the "Program Description" text for VEGP license renewal application section B.3.23 and confirmed that VEGP is currently using the ASME Code Section XI Edition 2001, including the 2002 and 2003 Addenda that is consistent with the GALL AMP XI.M3 recommendation. The staff finds the applicant's response and the revision to the LRA acceptable; on the basis this portion of the program is consistent with the GALL AMP XI.M3 recommendation.

In its review of Exception (1), the staff noted that LRA AMP B.3.23, "Reactor Vessel Closure Head Stud Program," states that volumetric examinations are in compliance with the performance demonstration initiative (PDI) and the applicant considered this as an exception to the GALL AMP XI.M3, "Reactor Head Closure Studs," recommendations. However, the staff recognized that GALL AMP XI.M3 recommends volumetric examination in accordance with the general requirements of Subsection IWA-2000 and does not mention specifically compliance with the PDI criteria of 10 CFR 50.55a. During the audit and review, the staff requested that the applicant clarify whether its PDI program activities for volumetric examinations are exceptions to the criteria in GALL AMP XI.M3 or they are beyond the recommendations of GALL AMP XI.M3. The staff also asked the applicant to discuss how its PDI activities for the volumetric examinations of the closure studs ensure that the volumetric examinations would be capable of detecting the aging effects that are applicable to the studs for the period of extended operation.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that:

ASME Section XI, Mandatory Appendix VIII addressed performance demonstration for ultrasonic examination systems. The performance demonstration requirements implemented in Appendix VIII to ASME Section XI include requirements for examination procedures, personnel qualification, and examination qualification testing. This approach provides a high level of assurance that the combination of equipment, personnel, and procedure is capable of detecting flaws during volumetric examinations. The techniques described in Appendix VIII to ASME Section XI were developed using a consensus process and have been approved for use by the staff via 10 CFR 50.55a. Examinations qualified to meet Appendix VIII requirements provide a higher level of assurance that flaws will be detected and accurately sized when compared with previously used volumetric examination requirements.

Regarding implementation of Appendix VIII, 10 CFR 50.55a (g)(6)(C) states:

"Implementation of Appendix VIII to Section XI. (1) Appendix VIII and the supplements to Appendix VIII to Section XI, Division 1, 1995 Edition with the 1996 Addenda of the ASME Boiler and Pressure Vessel Code must be implemented in accordance with the following schedule: Appendix VIII and Supplements 1, 2, 3, and 8--May 22, 2000; Supplements 4 and 6--November 22, 2000; Supplement 11--November 22, 2001; and Supplements 5, 7, and 10--November 22, 2002."

And, 10 CFR 50.55a (b)(1)(xxiv) states:

> "Incorporation of the Performance Demonstration Initiative and Addition of Ultrasonic Examination Criteria. The use of Appendix VIII and the

supplements to Appendix VIII and Article I-3000 of Section XI of the ASME BPV Code, 2002 Addenda through the latest edition and addenda incorporated by reference in paragraph (b)(2) of this section, is prohibited."

Appendix VIII, Supplement 8 provides qualification standards for bolts and studs. Therefore, SNC was required by 10 CFR 50.55a (g)(6)(C) to implement PDI requirements for examination of reactor vessel closure head studs no later than May 22, 2000. Additionally, SNC is currently prohibited by 10 CFR 50.55a (b)(1)(xxiv) from using Appendix VIII and the supplements to Appendix VIII from the 2002 Boiler & Pressure Vessel Code, or any later edition and addenda incorporated into 50.55a.

As a result, this exception is intended to clarify that examinations of reactor vessel closure head studs will comply with ISI Program requirements as implemented consistent with 10 CFR 50.55a and not any specific ASME Section XI Code edition and addenda cited in NUREG-1801, Section XI.M3.

The staff reviewed the above applicant's response and determined that 1) the applicant clearly explained that VEGP is required to incorporate PDI qualifications instead of the supplements to Appendix VIII and Article I-3000 of Section XI of the ASME Code, 2002, and 2) the staff verified that the required PDI qualifications are more restrictive than the requirements ASME Section IX, IWB-3500 that are recommended by GALL XI.M3.

On the basis of its review, the staff finds the applicant's response and this portion of Exception (1) acceptable.

In its review of the exception (2), the staff noted that LRA AMP B.3.23, "Reactor Vessel Closure Head Stud Program," states that VEGP will not include surface examination in this program, since ASME Code, Section XI, 2001 Edition, including the 2002 and 2003 addenda, does not require surface examination. However, the staff recognized that the GALL AMP XI.M3, "Reactor Head Closure Studs," program element "detection of aging effects," states the program uses visual, surface, and volumetric examinations in accordance with the general requirements of Subsection IWA-2000. The GALL AMP XI.M3 also states that the program uses magnetic particle, liquid penetration, or eddy current surface examination to indicate the presence of surface discontinuities and flaws. Also, in RG 1.65, Paragraph C.4, the NRC recommended that the requirements of Section XI of the ASME Code should be supplemented to include a surface examination in accordance with paragraph NB-2545 or NB-2546 of Section III of the ASME Code. During the audit and review, the staff asked the applicant to provide technical justification for excluding surface examinations from the scope of this program, or enhance the VEGP program to include surface examinations as recommended by the GALL AMP XI.M3.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that VEGP UFSAR Section 1.9.65.2 describes the VEGP position regarding conformance with NRC Regulatory Guide 1.65. VEGP UFSAR Section 1.9.65.2, Item3, states that all bolting surface examinations will be performed in accordance with ASME Section XI in lieu of paragraph NB-2545 or NB-2546 of ASME Section III. The applicant also stated that volumetric examination techniques, especially those in conformance with Appendix VIII to ASME Section XI are much improved over the volumetric techniques available at the time Regulatory Guide 1.65 was issued (October 1973) and currently, surface examination in addition to volumetric examination does not provide a significant improvement in assurance of the level of quality and safety.

The staff discussed the applicant's response with the applicant's technical staff during the audit and review. The staff also reviewed the Reactor Vessel Closure Head Stud Program related documents and the VEGP Units 1 and 2 Inservice Inspection Summary Reports for the reactor closure head studs. The staff concludes that VEGP reactor closure studs examinations in conformance to ASME Section XI. The applicants program is in accordance with a later addition to the ASME Section XI code and therefore provides an acceptable basis for the exception to GALL Report.

On the basis of this review, the staff finds the applicant's response and the exception (2) to the GALL AMP XI.M3 acceptable.

Operating Experience LRA Section B.3.23 states that Reactor Vessel Closure Head Stud Program inspections are based on ASME Code requirements. Because the ASME Code is a consensus document widely used over a long period, it has been effective in managing aging effects in components and their attachments.

The applicant stated that the Reactor Vessel Closure Head Stud Program is in accordance with general requirements for engineering programs. Periodic program reviews ensure compliance with regulatory, process, and procedural requirements.

Recent VEGP records show pitting of the nuts and washers for three Unit 2 closure stud assemblies. In the applicant's engineering judgment, the pitted nuts and washers no longer met minimum contact surface requirements and were replaced.

The applicant also stated that GALL AMP XI.M3, "Operating Experience" element states that the SCC has occurred in BWR pressure vessel head studs (Stoller 1991). The aging management program has provisions regarding inspection techniques and evaluation, material specifications, corrosion prevention, and other aspects of reactor pressure vessel head stud cracking. The applicant further stated that implementation of the program provides reasonable assurance that the effects of cracking due to SCC or IGSCC and loss of material due to wear will be adequately managed so that the intended functions of the reactor head closure studs and bolts will be maintained consistent with the current licensing basis for the period of extended operation.

During the audit and review, the staff noted that the applicant in the operating experience section of the Reactor Vessel closure Head Stud Program states that review of recent VEGP records identified pitting of the nuts and washers for three Unit 2 closure stud assemblies. However, the staff recognized that neither LRA AMR tables, nor GALL Volume 2 tables, includes managing loss of material due to corrosion pitting for closure head stud assemblies in the scope of this program. The staff asked the applicant to clarify whether, or not, loss of material due to pitting is included in this program. Also, the staff requested that the applicant discuss how this aging effect is managed by Rector Closure Stud Program, and to provide additional details on identification of pitting of the nuts and washers and the associated corrective actions.

Further, the staff asked the applicant to provide additional details on VEGP's operating experience related to this program, with emphasize on identification of cracking, loss of material, or leakage, during the last five years of operation.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant in its response stated that an AMR line item to address corrosion of the VEGP RPV closure head studs was inadvertently omitted from Table 3.1.2-1. The staff confirmed that the applicant in its letter dated March 20, 2008 added an Item"6d" to VEGP LRA Table 3.1.2-1 to address corrosion of closure studs, nuts, and washers, and credited the Reactor Vessel Closure Head Stud Program to manage this aging effect.

The staff finds this response acceptable and that the applicant has addressed the relevant operating experience because: (1) the applicant appropriately amended the LRA to include an AMR on loss of material due to corrosion of closure studs, nuts, and washers in LRA Table 3.1.2-1, (2) the program is designed to manage and detect the aging effects that are applicable to the RV closure stud assembly components, and (3) the program has been determined to be consistent with GALL AMP X1.M3 "Reactor Head Closure Studs".

The staff confirmed that the "operating experience" program element satisfies the criteria defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.23, the applicant provided the UFSAR supplement for the Reactor Vessel Closure Head Stud Program. The staff reviewed this section and determined 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 Vessel Closure Head Stud Program, the staff concludes 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 determined 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.3.25 describes the existing Reactor Vessel Surveillance Program (RVSP) as consistent, with exceptions and enhancements, with GALL Report, XI.M31, "Reactor Vessel Surveillance".

The applicant stated that the RVSP is an existing condition monitoring program that manages loss of fracture toughness due to neutron embrittlement in reactor vessel alloy steel materials exposed to neutron fluence exceeding 1 x 10^{17} n/cm^2 (E > 1.0 MeV). The program is based on 10 CFR 50, Appendix H, “Reactor Vessel Material Surveillance Requirements“ and ASTM E 185-82, “Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels.”

Capsules are periodically removed during the course of plant operating life. Neutron embrittlement is evaluated through surveillance capsule testing and evaluation, fluence calculations and benchmarking, and monitoring of effective full power years (EFPYs).

Exception The LRA states an exception for both the VEGP, Unit 1 and 2 RVs, that capsules with accumulated neutron fluence equivalent to 60 years of operation have already been pulled and tested. The exception also stated that the remaining capsules (2 capsules in each unit) will be removed such that, at the time of removal, each of the remaining capsules will have accumulated neutron fluence that is not less than once, nor greater than twice, the peak end of life fluence expected for an additional 20-year license renewal term (80 years of operation).

Enhancement 1 The LRA stated an enhancement that would involve, program documents revision which require that tested and untested specimens from all capsules removed from the VEGP RVs remain in storage. Also, alternate dosimetry would be installed to monitor neutron fluence on the RVs after removal of the last surveillance capsule from each unit. This enhancement will be implemented prior to removal of the last surveillance capsule in each unit.

Staff Evaluation The staff reviewed the applicant's proposed RVSP with its exception and enhancements to the NUREG-1801, Section XI.M31, “Reactor Vessel Surveillance,” requirements to determine whether the AMP remains adequate to manage the aging effects for which it is credited.

The RVSP, which is designed and implemented in accordance with 10 CFR Part 50, Appendix H, uses testing of the RV surveillance capsule test specimens as the basis for monitoring for neutron irradiation-induced embrittlement in base metals (plate or forgings) and welds that are located in the beltline region of the low alloy steel RV. VEGP's RVSP consisted of six surveillance capsules. Fracture toughness of beltline materials is indirectly monitored through measurement of the impact energy of Charpy V-Notch specimens. To date, four surveillance capsules were removed from the VEGP RV and tested. For both the VEGP, Unit 1 and 2 reactor vessels, capsules with accumulated neutron fluence equivalent to 60 years of operation have already been pulled and tested. The remaining capsules (2 capsules in each unit) will be removed such that, at the time of removal, each of the remaining capsules will have accumulated neutron fluence that is not less than once, nor greater than twice, the peak end of life fluence expected for an additional 20-year license renewal term (80 years of operation).

The staff confirmed that Capsule X (3.53×10^{19}, n/cm^2, E > 1 MeV) from VEGP, Unit 1 and Capsule W (2.98×10^{19} n/cm^2, E > 1 MeV) from VEGP, Unit 2 were exposed to fluences greater than the peak projected neutron fluence for their associated RV at 60 years of operation. Hence, the applicant has already met all RVSP requirements to support operation of VEGP, Units 1 and 2 through 60 years of operation. Removal of the remaining capsules at a fluence equivalent to 80 years of operation is appropriate because capsule data for fluences equivalent to 60 years of operation fluence has already been obtained. The applicant stated that the enhancement would involve, program documents revision which require that tested and untested specimens from all capsules removed from the VEGP RVs remain in storage. Also, alternate dosimetry would be installed to monitor neutron fluence on the RVs after removal of the last surveillance capsule from each unit. This enhancement will be implemented prior to removal of the last surveillance capsule in each unit.

The staff finds this response acceptable because future capsule testing will provide assurance that neutron irradiation-induced embrittlement in the RV beltline materials as a result of any change in projected neutron fluence can be monitored effectively during the extended period of operation.

The staff accepts the applicant's RVSP based on the following:

- the testing of the surveillance capsules in accordance with the proposed schedule provides assurance that the neutron-induced embrittlement in low alloy steel RV base metals and their associated welds will be adequately monitored during the extended period of operation
- the applicant's RVSP complies with the requirements of the 10 CFR Part 50, Appendix H.

The staff finds this program element acceptable because the applicant's discussion of the operating experience program element satisfies the criteria defined in the GALL Report.

Operating Experience The AMP B.3.25 states that the RVSP is an existing condition monitoring program that manages loss of fracture toughness due to neutron embrittlement in RV alloy steels exposed to neutron fluence exceeding 1×10^{17} n/cm^2 (E > 1.0 MeV). The applicant stated that the staff has approved the use of the program during the period of current operation. Surveillance specimens have been removed and tested. Where applicable, credible data from these specimens have been used to verify embrittlement rates and predict future performance of RV materials with regard to neutron embrittlement. For VEGP, Unit 1, the most recent results submitted to the NRC are documented in WCAP-16278-NP, Revision 0, "Analysis of Capsule X from the Southern Nuclear Operating Company, Vogtle Unit 1 Reactor Vessel Radiation Surveillance Program." For VEGP, Unit 2, the most recent results submitted to the NRC are documented in WCAP-16382-NP, Revision 0, "Analysis of Capsule W from the Southern Nuclear Operating Company, Vogtle Unit 2 Reactor Vessel Radiation Surveillance Program." Both of these reports include data from surveillance capsules exposed to a neutron fluence equivalent to 60 years of operation.

UFSAR Supplement In LRA Section A.2.25, the applicant provided the UFSAR supplement for the Reactor Vessel Surveillance Program. The staff reviewed the applicant's license renewal commitment list dated August 11, 2008 and confirmed that this program enhancement is identified as Commitment No. 21 to be implemented prior to the period of extended operation.

Conclusion On the basis of its review of the applicant's RVSP, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL REPORT, are consistent. Also, the staff reviewed the exception and enhancement and confirmed that their implementation prior to the period of extended operation would support the requirements of the 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 current licensing basis for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.0.3.2.16 Steam Generator Tubing Integrity Program

Summary of Technical Information in the Application LRA Section B.3.26 describes the existing Steam Generator Tubing Integrity Program as consistent, with exception, with GALL AMP XI.M19, “Steam Generator Tube Integrity.”

The applicant stated that the existing Steam Generator (SG) Tubing Integrity Program is a subprogram of the integrated Steam Generator Program for managing the SGs. The Steam Generator Tubing Integrity Program focuses on SG tube integrity, tube plugging, and the management and repair of SG tubing. The program complies with the program described in NEI 97-06, “Steam Generator Program Guidelines,” and VEGP Technical Specifications Section 5.5.9.

Preparation and approval of program deviations from NEI 97-06 are in accordance with NEI 97-06 and EPRI steam generator management program guidance.

The applicant also stated that the Steam Generator Tubing Integrity Program incorporates performance criteria for structural integrity, accident-induced leakage, and operational leakage consistent with NEI 97-06 and VEGP Technical Specifications.

The program includes a balance of prevention, inspection, evaluation and repair, and leakage monitoring. Major program elements are degradation assessments, inspection, integrity assessments, leakage monitoring, and chemistry controls.

The applicant further stated that NEI 97-06 refers to EPRI guidelines for SG examination, integrity assessment, primary to secondary leakage monitoring, *in-situ* testing, and water chemistry controls. The Water Chemistry Control Program maintains water chemistry controls for primary and secondary water chemistry.

Staff Evaluation During its audit and review, the staff confirmed 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.

During its audit and review, the staff reviewed the program elements of the LRA B.3.26, “Steam Generator Tube Integrity Program,” for which the applicant claims consistency with GALL AMP XI.M19, “Steam Generator Tube Integrity Program,” with the exception described below. The staff also reviewed the license renewal program basis document for the applicant’s Steam Generator Tube Integrity Program and interviewed VEGP staff members involved with implementation of the Steam Generator Tube Integrity Program.

In the “operating experience” program element for AMP B.3.26, “Steam Generator Tubing Integrity Program, the applicant states that wear due to interaction with loose parts or foreign objects have been identified for VEGP. During the audit and review, the staff asked the applicant to discuss how loose or foreign objects are detected and controlled under the Steam Generator Integrity Program.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant stated in its response that detection and control of foreign objects in the secondary side of the VEGP steam generators is achieved through diverse means. Inspections during outages for loose parts and foreign objects are accomplished through eddy current inspections and secondary-side foreign object search and retrieval. Removal of foreign objects is achieved in the foreign object search and retrieval or in sludge lance cleaning. The applicant provided additional details on the eddy current inspections, secondary side foreign object search and retrieval, and sludge lance cleaning.

During the audit and review, the staff reviewed procedures for performing these activities and finds the applicant's approach adequate to detect and control loose or foreign objects. On the basis of this review, the staff finds the LRA B.3.26 program elements, with the exception described below, consistent with the GALL AMP XI.M19.

Exception In the LRA, the applicant identified an exception to the GALL Report program element "Program Scope," "Preventive Actions," "Detection of Aging Effects," and "Monitoring and Trending" elements. Specifically, the exception states that GALL XI.M19, references Revision 1 of NEI 97-06, "Steam Generator Program Guidelines." Currently, the VEGP Steam Generator Tube Integrity Program is implemented in accordance with Revision 2 of NEI 97-06. The LRA considers this difference an exception to the GALL Report.

During the audit, the staff asked the applicant to clarify how NEI 97-06 Revision 2 differs from Revision 1 and explain how the program elements are affected by the differences. Also, the staff requested that the applicant provide justification if any of the requirements of the program is relaxed /reduced.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. The applicant, in its response, stated that there is no functional reduction in program requirements in the NEI 97-06 Revision 2. The applicant has retained the original guidance or added Guide lines referenced in NEI 97-06 or EPRI Steam Generator Management Program procedures, where the guidance level of detail in NEI 97-06 was reduced. The applicant further stated that in the NEI correspondence with the NRC dated September 9, 2005, NEI states that Revision 2 of NEI 97-06 is consistent with Technical Specification Task Force Traveler (TSTF)-449 Revision 4, and that the NRC staff reviewed and approved TSTF-449, Revision 4, as documented in Generic Letter 2006-01. The applicant stated that staff's approval of TSTF-449, Revision 4 justifies use of Revision 2 of NEI 97-06.

On the basis that, the applicant stated that there is no functional reduction regarding using NEI 97-06, Revision 2, for implementation of the VEGP Steam Generator Tube Integrity Program, and because the NRC staff has reviewed and approved the Technical Specification Amendments based on NEI 97-06, Revision 2, the staff finds the applicant's response to the above question and the exception to the program acceptable.

Operating Experience LRA Section B.3.26 states that the Westinghouse Model F SGs have thermally-treated Alloy 600 tubes hydraulically expanded for the full depth of the tubesheet at each end with stainless steel broached-hole quatrefoil tube supports and chrome-plated Inconel anti-vibration bars. The tubes are arranged on a square pitch.

Active degradation mechanisms recognized by the applicant in the Unit 1 SGs include PWSCC of tubesheet joint bulges and over-expansions, circumferential outside diameter SCC (ODSCC) at the expansion transition, and axial ODSCC at the top of the tubesheet. The applicant detected PWSCC in Unit 1 tubesheet bulges during the spring 2005 refueling outage and ODSCC at the expansion region during the fall 2006 refueling outage. After these PWSCC and ODSCC detections in Unit 1, the applicant has plugged and stabilized a number of tubes.

No active degradation mechanisms have been detected by the applicant in the VEGP Unit 2 steam generators. The most recent Unit 2 steam generators eddy current inspection during the spring 2007 refueling outage detected no degradation mechanisms and no steam generator tubes were plugged.

VEGP has detected anti-vibration bar wear and tube wear due to interaction with loose parts or foreign objects as relevant degradation mechanisms (those found in similar plants with the same tubing material and with similar design features).

In 2002, an inadvertent addition of sodium hexametaphosphate to the condensate chemical feed tanks on both units exceeded the action level 3 limits for sodium in the steam generators. Both units were shut down immediately to reduce the high sodium and phosphate concentrations. Fill and drain processes effectively removed the sodium but significant phosphate residuals remain trapped in the steam generator due to interaction with internal surfaces and sludge. Small, but significant phosphate levels return during start-ups. Water Chemistry Control Program modifications included phosphate action levels and discontinued molar ratio control. During the last refueling outage for each VEGP unit, chemical cleaning of the secondary side removed approximately 7000 pounds of scale deposit from Unit 1 and 5000 from Unit 2. Following the removal of scale deposit and adsorbed phosphate, the applicant has monitored plant chemistry parameters to determine the best time to re-initiate molar ratio control.

The Steam Generator Tubing Integrity Program incorporates new industry operating experience and research data for periodic program improvement. EPRI steam generator guidelines forming the technical bases for the program are results of a consensus periodically updated by EPRI. The Steam Generator Program is in accordance with general requirements for engineering programs. Periodic program reviews and assessments ensure compliance with regulatory, process, and procedural requirements.

Review of recent Steam Generator Program performance results show that the program has found and corrected degradation attributable to aging effects requiring management (AERMs) effectively.

During the audit and review, the staff reviewed the above operating experience in the LRA and some of the operating experience referenced in the program basis document for the Steam Generator Tube Integrity Program and steam generators inspection reports for the previous refueling outages. The staff noted that in the “operating experience” program element for AMP B.3.26, “Steam Generator Tubing Integrity Program, the applicant stated that active degradation mechanism identified in VEGP, Unit 1 steam generators during spring 2005 refueling related to PWSCC and ODSCC. The applicant added that as a result, a number of tubes have been plugged and stabilized. However, no active degradation mechanisms have been identified in the VEGP Unit 2 and no SG tubes were plugged during the spring 2007 refueling outage.

The staff requested that the applicant provide the number of tubes of each replaced steam generators in each unit that have been repaired, stabilized or plugged to date, and clarify if any additional age-related degradation mechanisms that have induced aging effects in the VEGP Unit 1 SG tubes. Also, applicant should discuss the non-destructive examination (NDE) detection methods (including NDE probe used) those were used to detect the relevant aging mechanisms (including PWSCC and ODSCC).

In addition, the staff asked the applicant to provide explanation on why VEGP Unit 1 steam generator components has been degraded faster than Unit 2 steam generator components. Also, the staff asked the applicant whether or not the degradation mechanisms that occurred in the Unit 1 steam generator components could potentially occur in the Unit 2 steam generator components during the period of extended operation and if so, whether they need to be managed.

The applicant provided its response to the staff's questions in a letter dated February 8, 2008. The applicant in its response stated that the repair of tubes at VEGP Unit 1 involves only plugging and stabilization, and that the repaired tubes are the same as those that are plugged, some of which are also stabilized. The numbers of tubes in VEGP Unit 1 and Unit 2 that are plugged or stabilized are provided in the following table:

Steam Generator	Unit 1 Tubes Plugged	Unit 1 Tubes Stabilized	Unit 2 Tubes Plugged	Unit 2 Tubes Stabilized
1	9	3	5	1
2	14	6	12	2
3	25	3	4	3
4	26	11	21	2

In its response, the applicant also stated that wear in an additional age-related mechanism that can induced loss of material at VEGP Unit 1 SG tubes, and that component rubbing or fretting, pressure pulse cleaning, ultrasound cleaning, and cavitation are process than can lead to wear. The applicant stated that wear can occur at the tube intersections with the antivibration bars, and at the SG flow distribution baffle plate. The applicant stated, however, that the amount of wear detected in the industry has not been significant enough to warrant generic attention by the industry's vendors or owners groups. The applicant stated, however, that the eddy current examinations performed under this program are sufficient to detect cracking or loss of material (including that induce by wear) in the components for which the program is credited.

The staff finds this response acceptable on the basis that it provided details on the steam generator tubes that were plugged and stabilized. Also, the staff's review of the program operating experience documented in the basis document for the Steam Generator Tubing Integrity Program did not reveal any unusual or significant findings.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.26, the applicant provided the UFSAR supplement for the Steam Generator Tubing 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).

Conclusion On the basis of its audit and review of the applicant's Steam Generator Tubing Integrity Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and its 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Structural Monitoring Program

Summary of Technical Information in the Application LRA Section B.3.32 describes the existing Structural Monitoring Program as consistent, with enhancements, with GALL AMP XI.S6, "Structures Monitoring Program."

The Structural Monitoring Program is based upon the requirements and guidance of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Regulatory Guide 1.160, Revision 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." VEGP uses the Structural Monitoring Program to monitor the condition of structures and structural components within the scope of the Maintenance Rule for reasonable assurance there is no loss of structure or structural component intended function. Enhancements to the Structural Monitoring Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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 interviewed the applicant's technical staff and reviewed the Structures Monitoring Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.S6.

The staff finds the applicant's Structures Monitoring Program acceptable because it conforms to the recommended GALL AMP XI.S6, "Structures Monitoring Program," with enhancements as described below.

Enhancement 1: In the LRA, the applicant stated an enhancement to the GALL Report program element "Program Scope." Specifically, the enhancement states:

> The Scope of the Structures Monitoring Program will be expanded to include the additional structures that require monitoring for license renewal.

The staff reviewed the applicant's Structural Monitoring Program, and their Aging Effect Requiring Managements (AERMs) under the scope of the structural monitoring program. The staff finds that the additional structures that require monitoring for license renewal during the period of extended operation are:

- Alternate Radwaste Building
- Dry Active Waste (DAW) Warehouse
- DAW Processing Facility
- Radwaste Process Facility
- Radwaste Transfer Building
- Radwaste Transfer Tunnel (Portion near Auxiliary Building only)
- Fire Water Pump House (including Diesel Storage Tank Support Structure)
- Fire Protection Valve House
- Fire Water Storage Tank Structure
- Valve Boxes and Pull Boxes

The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.32, "Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

<u>Enhancement</u> 2: In the LRA, the applicant stated an enhancement to the GALL Report program element "Program Scope." Specifically, the enhancement states:

> The scope of inspection for structures that require monitoring for license renewal will be clarified. An area-based inspection will be performed unless a detailed inspection scope is provided.

The staff reviewed the applicant's Structural Monitoring Program, and their AERMs under the scope of the structural monitoring program. The staff finds that the additional structures that require monitoring for license renewal during the period of extended operation will be clarified and area-based inspections will include the structure and structural components, including foundations, hangers and supports (both safety-related and nonsafety-related).

The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.32, "Structures Monitoring Program," will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

<u>Enhancement</u> 3: In the LRA, the applicant stated an enhancement to the GALL Report program element "Program Scope." Specifically, the enhancement states:

> The Structural Monitoring Program scope for hangers and supports will be clarified.

The staff reviewed the applicant's Structural Monitoring Program, and their AERMs under the scope of the structural monitoring program. The staff finds that the additional structures that require monitoring for license renewal during the period of extended operation are properly identified in the program scope (nonsafety-related as well as safety-related hangers and supports). The program document currently indicates only Category 1 hangers and supports.

The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.32, “Structures Monitoring Program,” will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 4: In the LRA, the applicant stated an enhancement to the GALL Report program elements “Parameters Monitored or Inspected, Monitoring and Trending, and Acceptance Criteria.” Specifically, the enhancement states:

> The Structures Monitoring Program will be enhanced to include periodic ground water monitoring to confirm it remains non-aggressive as defined in NUREG 1801.

The staff reviewed the applicant’s Structural Monitoring Program, and their AERMs under the parameters monitored or inspected, monitoring and trending, and acceptance criteria of the structural monitoring program. The staff finds that the additional structures that require monitoring for license renewal during the period of extended operation includes periodic ground water samples will be obtained from locations near the power block structures. Samples will be monitored and evaluated for sulfates, chlorides, and pH; phosphate levels to confirm it remains non-aggressive as defined in GALL Report.

During the audit and review the staff asked the applicant to clarify the ground water monitoring frequency and its basis to confirm it remains non-aggressive. Also, to provide the most recent ground water monitoring and the results of this monitoring. In its response, the applicant stated that the Structures Monitoring Program will be enhanced to perform ground water monitoring at a maximum interval of five years irrespective of whether the below grade environment is aggressive or not. Initially, this period was set at five years based on the non-aggressive nature of under ground environment noted so far. Ground water monitoring frequency may be subject to modification (increased monitoring) based on plant specific environments, observed degradation or noticeable change in ground water chemistry. Ground water is considered aggressive when environmental conditions exceed threshold values (Chlorides > 500 ppm, Sulfates >1500 ppm, and pH < 5.5). The staff reviewed the results of the recently samples and found that they are non-aggressive as indicated in the table below:

Chemical Parameter	**Groundwater**		
	FSAR (1)	**Recent Lab Test (2)**	**Recent Lab Test (3)**
pH	6.1 - 11.3	7.42 - 8.24	5.77 - 6.34
Chlorides (ppm)	1.0 - 198.4	1.95 - 8.71	4.97 - 7.95
Sulfates (ppm)	3.6 - 36.6	2.9 - 12.5	1.63 - 11.95

Notes:

(1) Refer UFSAR Section 2.4 Table 2.4.12-3

(2) Recent test has been conducted by General Test Laboratory between 11/2/05 to 11/21/05.

(3) Recent test has been conducted by General Test Laboratory between 05/08/07 to 05/09/07.

The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.32, “Structures Monitoring Program,” will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 5: In the LRA, the applicant stated an enhancement to the GALL Report program elements “Program Scope, Parameters Monitored or Inspected, and Acceptance Criteria.” Specifically, the enhancement states:

> Under water inspection of the NSCW cooling tower basins, including appropriate inspection and acceptance criteria, will be added to the Structural Monitoring Program.

The staff reviewed the applicant’s Structural Monitoring Program, and their AERMs under the “scope,” “parameters monitored or inspected,” and “acceptance criteria,” program elements of the structural monitoring program. The staff finds that the additional structures that require monitoring for license renewal are appropriately included in the Structural Monitoring program. The staff also found the addition of inspection and acceptance criteria for under water inspection of the NSCW cooling tower basins to the Structural Monitoring program acceptable because when enhancement is implemented, VEGP AMP B.3.32, “Structures Monitoring Program,” will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed.

The applicant also stated that LRA Section A.2.32 will be implement the above five enhancements to the Structures Monitoring Program as indicated in the letter dated June 27, 2007, (Commitment No. 23).

On this basis, the staff finds these enhancements acceptable because when enhancements are implemented, the Structural Monitoring Program will be consistent with GALL AMP XI.S6 and will provide that the effects of aging are adequately managed.

Operating Experience LRA Section B.3.32 states that the Structural Monitoring Program is in accordance with general requirements for engineering programs. Periodic program reviews ensure compliance with regulatory, process, and procedural requirements.

The 1998 baseline inspections established a reference condition for comparison during later inspections. Periodic inspections commenced in April 2000 planned for every 10 years for the duration of plant operation.

The 1998 Structural Monitoring Program baseline inspections found the condition of the EDG exhaust enclosure unacceptable. After an evaluation the Corrective Action Program replaced the enclosure with an improved design.

Periodic inspections in 2005 found the rooms and areas structurally acceptable with only a few items noted as “acceptable with deficiency.” The Corrective Action Program increased the monitoring frequency. An example of an “acceptable with deficiency” condition is evidence of slight water intrusion on the north wall and floor of Auxiliary Building Level C. None of the deficient items required immediate action to maintain intended functions, and monitoring will continue for any change in condition.

The operating experience review has concluded that administrative controls are effective in detecting age-related degradation and initiating corrective action.

During the audit and review, the staff reviewed the above operating experience and the operating experience described in the program basis document and in various condition reports (CR), and interviewed the applicant's technical staff to confirm that the operating experience did not reveal any degradation not bounded by industry experience. Most of the documented conditions were rusted, cracked, leaked, and/or corroded structural components such as pipe supports, studs. The applicant corrected the conditions through their corrective action program. The staff did not identify any age-related related issues not bounded by the industry operating experience.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.32, the applicant provided the USAR supplement for the Structures Monitoring Program. The staff reviewed the applicant's license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that these enhancements to this program is identified as Commitment No. 23 to be implemented before the period of extended operation. The staff reviewed UFSAR Supplement section and determined that the information in the USAR 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 Structural Monitoring Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. 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 Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Structural Monitoring Program - Masonry Walls

<u>Summary of Technical Information in the Application</u> LRA Section B.3.33 describes the existing Structural Monitoring Program - Masonry Walls as consistent, with enhancement, with GALL AMP XI.S5, "Masonry Wall Program."

The Structural Monitoring Program - Masonry Walls is part of the Structural Monitoring Program implementing 10 CFR 50.65 structure monitoring requirements. The existing Masonry Wall Program manages aging of masonry walls and their structural steel restraint systems within the scope of license renewal. The program includes the concrete masonry units and restraint systems that seal and shield some access openings in the Seismic Category I structures from radiation.

There are no masonry walls in Seismic Category I structures but some Auxiliary Building access openings are sealed with concrete masonry units for radiation shielding and maintenance purposes. Steel angle or steel beam structural elements hold these concrete units in place.

The turbine building, the switch house located in the high-voltage switchyard, the dry active waste warehouse, dry active waste processing facility, radwaste process facility, radwaste transfer building, and the fire water pump houses are non-Category I structures that utilize masonry walls. The program has inspection guidelines that list attributes that cause masonry wall aging monitored during structural inspections and that establish examination criteria, evaluation requirements, and acceptance criteria. The program is based on guidance in NRC Office of Inspection & Enforcement (IE) Bulletin 80-11, "Masonry Wall Design," and NRC Information Notice 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to NRC IE Bulletin 80-11". The Structural Monitoring Program - Masonry Walls will be enhanced prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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.

The staff reviewed those portions of the Masonry Wall Program for which the applicant claims consistency with GALL AMP XI.S5 and finds that they are consistent with the GALL Report AMP. The staff finds the applicant's Masonry Wall Program acceptable because it conforms to the recommended GALL AMP XI.S5, "Masonry Wall," with the enhancement as described below.

Enhancement The LRA states an enhancement to the GALL Report program element "Scope of Program," specifically:

> The scope of the Structures Monitoring Program – Masonry Walls will be expanded to include monitoring of masonry walls in the structures which are in scope for license renewal but are not currently monitored under this program.

The staff reviewed the applicant's Structures Monitoring Program – Masonry Walls Program, the masonry wall structures, structural components, and their AERMs which are under the scope of the Structures Monitoring Program – Masonry Walls. The staff finds that the additional structures and components that require monitoring for license renewal during the period of extended operation are structures such as Radwaste Structures. Visual inspections of these plant structures are at ten-year intervals. However, more frequent inspections will be based on past inspection results, industry experience, or exposure to a significant event (*e.g.*, tornado, earthquake, fire, etc.).

The staff finds this enhancement acceptable because when implemented the Structures Monitoring Program – Masonry Walls will be consistent with GALL AMP XI.S5 and provide additional assurance that the effects of aging will be adequately managed.

Operating Experience LRA Section B.3.33 states that plant-specific operating experience comes from condition report searches, personnel interviews, and Structural Monitoring

Program inspection report reviews. The 1998 baseline inspections established a reference in time for comparison to later inspections. Periodic inspections commenced in April 2000 planned for every 10 years for the duration of plant operation.

The operating experience review has concluded that administrative controls are effective in detecting age-related degradation and initiating corrective action.

The staff reviewed the operating experience presented in the LRA and in the program basis document and interviewed the applicant's technical personnel and confirmed that the plant-specific operating experience revealed no degradation not bounded by industry experience.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.33, the applicant provided the UFSAR supplement for the Structural Monitoring Program - Masonry Walls. The staff reviewed the applicant's license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that these enhancements to this program is identified as commitment No. 24 to be implemented before the period of extended operation. The staff reviewed UFSAR Supplement 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 Structural Monitoring Program - Masonry Walls, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. 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 Report 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Fatigue Monitoring Program

Summary of Technical Information in the Application LRA Section B.3.38 describes the existing Fatigue Monitoring Program as consistent, with enhancements, with GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

The applicant stated that the Fatigue Monitoring Program consists of two existing programs, the Fatigue and Cycle Monitoring Program and Thermal Stratification Data Collection Program. The Fatigue and Cycle Monitoring Program, also known as the Component or Cyclic Transient Limit Program, is described in VEGP Technical Specification Section 5.5.5. Program controls track the transient cycles to maintain components within the design limit. The component cyclic or transient design limits are in VEGP UFSAR Section 3.9.N.1.

The Thermal Stratification Data Collection program monitors for adverse thermal stratification and cycling from isolation valve leakage in the normally stagnant nonisolable RCS branch lines identified in the VEGP response to IE Bulletin 88-08.

The applicant also stated that the Fatigue Monitoring Program monitors fatigue for ASME Code Class 1 components by software (FatiguePro™ software) that has three different modules: cycle counting, cycle-based fatigue monitoring, and stress-based fatigue (SBF) monitoring.

- Cycle Counting - The cycle-counting module counts and tracks the number of selected design transients that have occurred. Counting these cycles and demonstrating that current and projected cycles are fewer than assumed in design fatigue calculations validates those assumptions and confirms the expectation that fatigue usage will remain below the ASME Code Section III design limit.

- Cycle-Based Fatigue Monitoring - This module computes cumulative usage fatigue for each event that actually occurs using the design-basis severity specific to the monitored location.

- SBF Monitoring - The SBF monitoring module is the most precise of the three for monitoring fatigue usage. This module uses the actual temperature, pressure, and flow measurement data to calculate stress intensity ranges and fatigue at any location.

Calculated current and projected fatigue usage demonstrate that fatigue usage will continue to be below the design limit.

The applicant further stated that transients and components required to be monitored by the UFSAR are based on the following methodology (projections are based on a 60-year operating period):

- Determination of Class 1 components to be monitored is by comparison of both the design fatigue usage and the projected fatigue usage for the component to a screening value of cumulative usage fatigue less than 0.1.

- Determination of plant cycles to be monitored is by evaluation of the contribution of the lifetime projected plant cycles to the fatigue usage for any Class 1 component and by a screening level for the lifetime projected plant cycles of approximately 10 percent of the design allowable cycles.

- Fatigue monitoring (*e.g.*, SBF monitoring) of the limiting component(s) affected by a cycle may show that the ASME Code acceptance criterion of cumulative usage fatigue less than or equal to 1.0 remains valid even if the assumed number of cycles has been exceeded.

- Selection of screening levels accommodated the maximum anticipated effect of reactor water environmental factors for a projected 60-year operating period.

The UFSAR requires fatigue monitoring of specific components on each unit and of specific plant cycles. LRA Section 4.3.1 on metal fatigue TLAA evaluations details the monitored cycles and components and the fatigue monitoring module in use.

The applicant stated that the Fatigue Monitoring Program uses a combination of cycle-counting, cycle-based fatigue monitoring, and SBF monitoring to track fatigue usage. The software counts cycles and calculates fatigue usage for selected high-usage components. The fatigue-monitoring software counts most of the transient cycles required to be monitored by changes in plant instrument readings. Cycles that cannot be counted by installed instrumentation are counted manually (and then entered into the software). For some specific transients, VEGP uses SBF monitoring of bounding locations in lieu of cycle counting.

VEGP uses SBF monitoring of the main and auxiliary feedwater nozzles, the bounding locations for the feedwater cycling events, rather than counting of feedwater cycling events. VEGP uses SBF monitoring of the normal and alternate charging nozzles, the bounding locations in the Class 1 portion of the charging and letdown systems, rather than counting of loss of charging, loss of letdown events, or both.

In response to IE Bulletin 88-08, nonisolable sections of piping for the safety injection, normal and alternate charging, and auxiliary spray lines connected to the RCS have instrumentation to detect adverse thermal stratification and cycling due to potential isolation valve leakage into the RCS boundary. Temperature measurements detect fluid leakage by resistance temperature detectors strapped on the pipes. Temperature data periodically recorded and evaluated for thermal stratification and cycling determine impact on piping structural integrity. Additionally (on Unit 2 only), two 12-inch RHR suction lines attached to the reactor coolant loop hot leg have resistance temperature detectors. This monitoring is not part of the fatigue monitoring software.

The SBF fatigue-monitoring software module calculates the actual amount of fatigue from changes in temperature, pressure, or other parameters affecting the surge line and lower pressurizer and accounts for insurge/outsurge and thermal stratification effects. Thus, the applicant addresses WCAP-14574A Renewal Applicant Action Item 3.3.1.1.-1 for license renewal by using the SBF monitoring software for the pressurizer lower head and surge line nozzles.

The applicant also stated that it has evaluated environmentally-assisted fatigue of piping in the reactor coolant pressure boundary for locations equivalent to those in NUREG/CR-6260 Section 5.4 using NUREG/CR-5704 formulas for stainless steel components and NUREG/CR-6583 formulas for low-alloy steel components. All locations evaluated were acceptable for 60 years. The Fatigue Monitoring Program tracks the cumulative fatigue usage at four of these six components. The acceptance criterion for cumulative fatigue usage of those components is reduced to account for the environmental fatigue factor value determined in the environmentally-assisted fatigue evaluation. The design cumulative usage fatigue of the other two components is low enough that cycles monitoring ensures that the evaluation of environmentally-assisted fatigue remains valid. To manage environmental fatigue effects during the period of extended operation, the UFSAR will change to indicate that two locations not currently in the UFSAR, the accumulator/RHR nozzle and the pressurizer heater penetration, require fatigue monitoring.

Weld overlays installed on the Unit 2 pressurizer spray nozzle, pressurizer safety and relief nozzles, and the pressurizer surge nozzle will be installed on the corresponding Unit 1 pressurizer nozzles during the next 2008 refueling outage. This change does not affect the cycle-counting and cycle-based fatigue modules of the Fatigue Monitoring Program; however, the effects of the weld overlay on the stress-based module for monitoring the cumulative usage fatigue of the spray and surge nozzles is still under evaluation.

The applicant indicated that it intends to submit a license amendment request for a measurement uncertainty recapture power uprate in the near future. The applicant stated that it expects the number of assumed transients not to change and the cycle-based fatigue and SBF modules to remain unaffected; therefore, the Fatigue Monitoring Program should not be affected materially. The applicant stated that it will notify the staff as part of the 10 CFR 54.21(b) annual update of any CLB changes that materially affect the LRA. Enhancements to the Fatigue Monitoring Program will be implemented prior to the period of extended operation.

Staff Evaluation During its audit and review, the staff confirmed 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.

During the audit, the staff interviewed the applicant's technical staff and reviewed the basis documents related to the Fatigue Monitoring Program, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with the GALL AMP X.M1.

The staff reviewed those portions of the Fatigue Monitoring Program for which the applicant claims consistency with GALL AMP X.M1 and finds that they are consistent with the GALL Report AMP. The staff finds the applicant's Fatigue Monitoring Program acceptable because it confirms to the recommendation of the GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary," with enhancements as described below.

Enhancement 1. In the LRA, the applicant stated an enhancement to the GALL Report "program description." Specifically, the enhancement stated:

> The effect of the full structural weld overlays applied to the pressurizer spray and surge nozzles on the stress-based module for monitoring their CUF is still being validated. If the existing module is not conservative, the module will be revised so that it continues to provide valid results.

The staff reviewed the enhancement and determined that the enhancement is a conservative approach to monitoring CUF of full structural weld overlays applied to pressurizer spray and surge nozzles. In addition, the staff noted that LRA provides the CUF value of the limiting surge nozzle location for 60 years, which shows adequate margin to account for any changes due to the weld overlay. The staff verified that the applicant has incorporated this enhancement in Commitment No. 28 to the LRA, which was provided in the applicant's letter of June 27, 2007.

The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.38, "Fatigue Monitoring Program," will be consistent with GALL AMP XI.M1 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 2. In the LRA, the applicant stated an enhancement to the GALL Report program element "parameters monitored." Specifically, the enhancement stated:

> The UFSAR will be changed to require fatigue monitoring of the Accumulator/RHR nozzles and of the pressurizer heater penetration. These components are currently monitored but not specified in the UFSAR. These components were evaluated for environmental fatigue effects and monitoring of these components is required or desired for the period of operation.

The staff reviewed the enhancement and determined that the applicant already formalized the monitoring of the Accumulator/RHR nozzles on the cold legs and the pressurizer heater penetration in its operating procedure. The staff verified that the applicant has incorporated this enhancement in Commitment No. 28 to the LRA, which was provided in the applicant's letter of June 27, 2007. The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.38, "Fatigue Monitoring Program," will be consistent with GALL AMP XI.M1 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3. In the LRA, the applicant stated an enhancement to the GALL Report program element "acceptance criteria." Specifically, the enhancement stated:

> The implementing procedure for the Fatigue Monitoring Program will be enhanced to reduce the acceptable CUF value to account for environmental fatigue effects for those NUREG-6260 locations monitored for fatigue. The acceptable CUF for those locations will be reduced from the design code limit of 1.0 to 1 divided by the Fen value used for the environmental fatigue evaluation of that location.

The staff reviewed the GALL Report program element "acceptance criteria" and noted that it involves maintaining the fatigue usage below the design code limit considering environmental fatigue. The staff noted that the enhancement is more stringent than that stated in the GALL Report. The staff verified that the applicant has incorporated this enhancement in Commitment No. 28 to the LRA, which was provided in the applicant's letter of June 27, 2007. The staff finds this enhancement acceptable because when the enhancement is implemented, VEGP AMP B.3.38, "Fatigue Monitoring Program," will be consistent with GALL AMP XI.M1 and provide additional assurance that the effects of aging will be adequately managed.

Enhancement 4. In the LRA, the applicant stated an enhancement to the GALL Report program element "corrective actions." Specifically, the enhancement stated:

> The implementing procedure for the Fatigue Monitoring Program will be enhanced to explicitly require that the corrective actions initiated for exceeding an acceptance criterion include a review to identify and assess any additional affected reactor coolant pressure boundary locations.

The staff finds this enhancement acceptable because when enhancement is implemented, VEGP AMP B.3.38, “Fatigue Monitoring Program,” will be consistent with GALL AMP XI.M1 and provide additional assurance that the effects of aging will be adequately managed. The staff verified that the applicant has incorporated this enhancement in Commitment No. 28 to the LRA, which was provided in the applicant’s letter of June 27, 2007.

During the audit, the staff noted that the applicant did not establish an implementation schedule for these enhancements to the existing Fatigue Monitoring Program. The staff asked the applicant to provide clarification on when these enhancements will be implemented. In its response, the applicant stated the LRA will be amended to reflect that the enhancements to the Fatigue Monitoring Program will be implemented at least two years prior to the period of extended operation. The staff finds the applicant’s response acceptable because these enhancements will be adopted prior to the period of extended operation. In a letter dated August 11, 2008, the applicant amended the application and identified Commitment No. 28 to be implemented prior to the period of extended operation. The Commitment List reflects the above response.

During the audit, the staff also requested the applicant to provide a list of components that rely on SBF monitoring by Fatigue Monitoring Program to disposition the fatigue TLAA. In its response, the applicant provided a list of those components and proposed to amend its application so that list is included in its LRA. In its letter dated June 26, 2008, the applicant amended the application by adding the list of components that rely on SBF monitoring. The staff finds the applicant’s response acceptable since it provides clarification to show which components are managed by SBF monitoring method.

The staff also asked the applicant, during the audit, to explain how each of the locations evaluated for environmentally assisted fatigue was shown to be acceptable. In its response, the applicant proposed to amend the application so it is clear how these locations were acceptable. Specifically, each component’s 60-year projected CUF is multiplied by its Fen value and the result is less than 1. The design limit for these components is 1.0 and therefore, the staff concludes that the components meet the acceptance criteria as stated in the LRA. On this basis, the staff finds the applicant’s response acceptable. In its letter dated June 26, 2008, the applicant amended the LRA to show how each of the locations evaluated for environmentally assisted fatigue was acceptable.

The applicant stated in the LRA that it will notify the staff, as part of the 10 CFR 54.21(b) annual update of any CLB changes that materially affect the LRA, specifically fatigue monitoring program during a measurement uncertainty recapture power uprate process. The staff identified this commitment as a confirmatory Item(CI- 3.0.3.2.19-1).

In a letter dated June 26, 2008, the applicant indicated that they had completed a review of the pertinent documentation and identified the following changes, which materially affect the contents of the VEGP LRA:

- Implementation of Measurement Uncertainty Recapture (MUR) Power Uprate

- Installation of full structural weld overlays on the Unit 1 pressurizer spray nozzle, pressurizer safety and relief nozzles, and the pressurizer surge nozzle

Enclosure 1 of the June 26 letter describes the LRA changes made necessary by both the annual update and the RAI response. The staff reviewed the applicant's approach and finds it acceptable because the applicant appropriately provided the CLB changes that materially affect the LRA, including the fatigue monitoring program, during a measurement uncertainty recapture power uprate process.

During the audit, the staff asked the applicant regarding the benchmarking process and validation results for the software using transient data. The applicant's response was reviewed in parallel with the environmentally assisted fatigue evaluation, and the results on those responses are discussed in the TLAA Section 4.3.1 of this SER.

In a letter dated March 20, 2008, the applicant submitted an amendment to the LRA, which consisted of editorials changes to the LRA. The staff reviewed these editorial changes and determined that they do not affect the staff's assessment of acceptability of the Fatigue Monitoring Program.

Operating Experience LRA Section B.3.38 states that the set of design-basis transients was a conservative estimate of the number, types, and severity of events that could occur during normal and accident conditions. Actual operating transients, however, determine the real fatigue usage on components. Westinghouse pressurized-water reactor plant experience indicates that actual operating transients are often fewer and less severe than postulated in the design basis.

The applicant stated that industry and plant-specific operating experience were factored into the Fatigue Monitoring Program when it was established. Monitored locations include those that operating experience shows are likely to accumulate significant fatigue usage at Westinghouse plants. The Operating Experience Program reviews industry operating experience, disseminates that information to appropriate personnel (including the engineer responsible for fatigue monitoring), collects plant-specific operating experience, and disseminates that information to the rest of the industry when appropriate. Operating experience shows the program's ability to monitor cycles and fatigue usage and to make program changes as necessary.

The applicant also stated that Fatigue Monitoring Program incorporated fatigue-monitoring software in 1995. A fatigue and cycle-monitoring report every 18 months provides the current count of cycles requiring monitoring and the current fatigue usage for components requiring fatigue monitoring. The report also provides 40- and 60-year projections for both monitored cycles and fatigue usage at monitored components. Review of these reports determines whether any monitored locations require further action. As an example, the feedwater and auxiliary feedwater nozzles were changed from cycle-counting to fatigue-calculated monitoring when projected cycles of feedwater cold water slug events exceeded the assumed limit. Similarly, the program changed to use SBF monitoring based on cycle-counting results for the charging nozzles.

The staff reviewed the operating experience provided in the LRA and in the program basis document and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff asked the applicant to provide operating experience on the temperature measurement of normally stagnant non-isolable RCS branch lines. In its response, the applicant provided operating experience on the applicable resistance temperature detectors (RTD). The applicant identified only one instance where RTDs indicated a problem, which was corrected by having a valve repacked. The staff noted that this problem was corrected as the thermal stratification data was gathered and analyzed for several weeks. Therefore, the staff finds the applicant's response acceptable. Based on the above reviews, staff confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.38, the applicant provided the UFSAR supplement for the Fatigue Monitoring Program. The staff also verified that Commitment No. 28 for enhancements of the program is scheduled for implementation prior to the period of extended operation. The staff reviewed UFSAR Supplement 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 Fatigue Monitoring Program, the staff concludes that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. 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 Report AMP to which it was compared. As provided above, the applicant appropriately resolved confirmatory Item3.0.3.2.19. 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 determined 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:

- ACCW System Carbon Steel Components Program
- Bolting Integrity Program
- Diesel Fuel Oil Program
- Inservice Inspection (ISI) Program
- Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations
- Periodic Surveillance and Preventive Maintenance Activities

- Reactor Vessel Internals Program
- Steam Generator Program for Upper Internals
- Inservice Inspection Program - IWE
- Inservice Inspection Program - IWL
- Non-EQ Cable Connections One-Time Inspection 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 ACCW System Carbon Steel Components Program

Summary of Technical Information in the Application LRA Section B.3.1 describes the new ACCW System Carbon Steel Components Program as a plant-specific program.

The applicant stated that the Auxiliary Component Cooling Water (ACCW) System Carbon Steel Components Program manages, by a combination of leakage monitoring and routine and periodic inspections, cracking of carbon steel components exposed to ACCW. The program responds to operating experience with nitrite-induced SCC and subsequent ACCW system component leakage. The scope of this program covers the carbon steel components exposed to ACCW, including the Units 1 and 2 ACCW systems as well as carbon steel components serviced by those systems. The ACCW system services nonsafety-related heat loads.

The applicant also stated that there has been nitrite-induced SCC in the Unit 2 ACCW system and the scope of this program conservatively includes the Unit 1 ACCW system due to similarities in chemistry control regime, normal operating temperatures, materials of construction, and design.

The applicant further stated that the program formalizes some activities and adds new activities. The program relies upon leakage detection monitoring, routine walk-downs, and periodic visual examinations. Operating experience shows that the program detects and repairs ACCW system leaks attributed to nitrite-induced SCC prior to any loss of system intended function or any significant impact on system pressure, flow, or integrity.

The program also has preventive measures for repairs and modifications to minimize crack initiation sites, lower stresses, and improve inspectability. The ACCW System Carbon Steel Components 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.3.1 on the applicant's demonstration of the ACCW System Carbon Steel Components 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 ACCW System Carbon Steel Components Program against the staff's recommended program element criteria that are provided in SRP-LR

Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the ACCW System Carbon Steel Components Program would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program – The "scope of the program" program element criterion in SRP-LR Section A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

The applicant states in LRA Section B.3.1 that the carbon steel components in both Units 1 and 2 ACCW systems and the carbon steel components serviced by the ACCW systems are included within the scope of this program. Although the high-temperature and highly-stressed ACCW system portions are critical locations for nitrite-induced SCC, the scope of this program conservatively includes all of the carbon steel components exposed to ACCW. Operating experience with nitrite-induced SCC in the Unit 2 ACCW system necessitates this program. There have been no nitrite-induced SCC leaks in the Unit 1 ACCW system, but this system is included conservatively in the program scope due to its similar chemistry control regime, normal operating temperatures, materials of construction, and design.

During the audit and review, the staff reviewed the applicant's program basis documents and determined that it adequately identified all the components within the scope of this AMP. Additionally, the staff noted that although there have been no nitrite-induced SCC leaks in the Unit 1 ACCW system; those components are included within the scope of this AMP. The staff finds the "scope of the program" acceptable since it specifically identifies the components within the scope of the ACCW System Carbon Steel Component Program.

The staff confirmed that the "scope of the program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds this program element acceptable.

(2) Preventive Actions – The “preventive actions” program element criterion in SRP-LR Section A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The applicant states in LRA Section B.3.1 that the ACCW System Carbon Steel Components Program has the following design controls on ACCW system carbon steel component repairs and new installations to prevent recurrence of SCC:

- New installations and component repairs will prevent the creation of crevices shown by operating experience to serve as SCC initiation sites. Butt-welded piping will not use backing rings. For critical locations (high temperature, high stress, or both), socket welds will be avoided when possible.

- System stresses in new installations and component repairs will be reduced where practical. New installation and component repair processes will include guidance to reduce assembly stresses.

During the audit and review, the staff reviewed the applicant’s program basis documents for this program which adequately described the mitigative actions that are focused on prevention of SCC recurrence and primarily consist of design controls on new installations and repairs. Further, the program basis documents state that, although the mitigative aspects are not currently implemented, those actions will be implemented prior to the period of extended operation. The staff noted that the program basis documents describe that the mitigative actions include revising piping specifications to prohibit the use of backing rings in susceptible locations, favor the use of butt-welded joints over socket welded fittings, and require post weld heat treatment (PWHT) stress relief. The staff also noted that the ACCW System Carbon Steel Components Program will use multiple engineering methods to reduce the stresses that contribute toward the occurrence of nitrite-induced SSC. On this basis, the staff finds this program element acceptable.

The staff confirmed that the “preventive actions” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected – The “parameters monitored or inspected” program element criterion in SRP-LR Section A.1.2.3.3 are:

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).
>
> The parameters monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.3.1 that the ACCW System Carbon Steel Components Program inspects and monitors for ACCW component leakage indicative of through-wall cracking due to nitrite-induced SCC. Parameters monitored include indications of component leakage based on observations, system make-up needs, room leakage alarms, and visual inspections.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which adequately described the parameters monitored or inspected include leak detection and other signs of leakage. The staff noted that operating experience has shown that leaks are properly entered into the applicant's corrective actions program to ensure that corrective actions are taken prior to loss of system intended functions. Further, the staff noted that the AMP includes periodic visual inspections during operator rounds and engineering walkdowns, and visual examinations at normal operating pressure. The applicant described that current NDE technologies are not available to reliably detect and discriminate SCC cracks, especially in butt-welds with backing rings, and in socket welds. The staff noted that leakage detection is used to identify nitrite-induced SCC because current NDE technologies are available for detection in various carbon steel piping configurations. On this basis, the staff finds the parameters monitored acceptable to manage the AERM for which the AMP is credited.

During the audit and review, the staff interviewed the applicant's technical staff who explained that the ACCW System Carbon Steel Components Program monitors all components susceptible to nitrite-induced SCC and that leak detection is effective in identifying nitrite-induced SCC. The applicant's technical staff also presented the program basis documents that identified that all components within the Unit 1 and Unit 2 ACCW systems and the carbon steel components serviced by the ACCW systems, are included within the scope of the ACCW System Carbon Steel Components Program and that the inspections are inclusive.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects – The "detection of aging effects" program element criteria in SRP-LR Section A.1.2.3.4 are:

> Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. Provide information that links the parameters to be monitored or inspected to the aging effects being managed. Describe "when," "where," and "how" program data are collected.
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience. Provide justification, including codes and standards referenced, that the technique and frequency are adequate to detect the aging effects before a loss of SC intended

function. A program based solely on detecting SC failures is not considered an effective aging management program.

When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects. The sample size should be based on such aspects of the SCs as the specific aging effect, location, existing technical information, system and structure design, materials of construction, service environment, or previous failure history. The samples should be biased toward locations most susceptible to the specific aging effect of concern in the period of extended operation. Provisions should also be included on expanding the sample size when degradation is detected in the initial sample.

The applicant states in LRA Section B.3.1 that plant-specific and industry operating experience show that detection of nitrite-induced SCC is difficult prior to system leakage. Plant-specific operating experience indicates that detection of leakage is possible well before leaks reach a size that can significantly impact system integrity. The applicant stated that the ACCW System Carbon Steel Components Program includes the following detection methods.

- ACCW surge tank low-level alarms. The program credits alarms and indicators for detection of significant system leakage. The Operations staff investigates abnormal tank level changes and detects significant leaks

- Leakage detection systems for ACCW components and equipment served by ACCW are monitored. Abnormal indications are cause for investigation by the Operations staff to determine the leakage source.

    - Containment leakage monitoring detects ACCW system leakage during power operations when the containment is inaccessible.

    - Leakage-monitoring systems for other locations with ACCW components and equipment served by ACCW monitor sumps and floor drain tanks.

- Visual observations of accessible areas by Operations Department personnel during routine rounds. Operations Department personnel conduct rounds of areas with accessible portions of the ACCW systems to detect evidence of leakage.

- ACCW system engineer walk-down visual inspections of accessible portions of the ACCW system.

- Periodic visual inspections of the external surfaces of the ACCW system under the External Surfaces Monitoring Program. The program's inspection criteria include signs of system leakage.

- Periodic VT-2 visual examinations at normal operating pressures for the safety-related portions of the system under the Inservice Inspection (ISI) Program.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which described that the detection of aging effects or inspections include leak detection systems, alarms, and other signs of leakage. The staff noted that the AMP includes periodic visual inspections during operator rounds and engineering walkdowns, and visual examinations at normal operating pressure. On this basis, the staff finds the detection of aging effects acceptable to manage the AERM for which the AMP is credited.

The staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending – The "monitoring and trending" program element criteria in SRP-LR Section A.1.2.3.5 are:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.
>
> This program element should describe "how" the data collected are evaluated and may also include trending for a forward look. This includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function. The parameter or indicator trended should be described. The methodology for analyzing the inspection or test results against the acceptance criteria should be described.

The applicant states in LRA Section B.3.1 that ACCW surge tank levels are monitored, alarms are monitored continuously, and containment leakage is trended. Operations Department personnel conduct rounds of the accessible portions of the ACCW system at least daily. The ACCW system engineer conducts walk-down inspections at least every refueling cycle with the system at normal operating pressure. Inaccessible portions are inspected when made accessible.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which adequately described the monitoring and trending includes leak detection as described above and that any unacceptable conditions are documented by the condition reporting process. The staff noted that the corrective actions program is used to identify adverse trends in lieu of this program element. On this basis, the staff finds the monitoring and trending program element acceptable to manage the AERM for which the AMP is credited.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5.

The staff finds this program element acceptable.

(6) Acceptance Criteria – The “acceptance criteria” program element criteria in SRP-LR Section A.1.2.3.6 are:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The applicant states in LRA Section B.3.1 that for visual inspections no indications of leakage are acceptable.

During the audit and review, the staff reviewed the applicant’s program basis documents for this program which described the acceptance criteria. The staff noted that the program basis documents stated that acceptance criteria of zero leakage ensures that any identified degradation of the system will be evaluated and resolved prior to any loss of system or component intended function. Further, the staff noted that the corrective actions program is used to evaluate and trend unacceptable conditions. On this basis, the staff finds the acceptance criteria acceptable to manage the AERM for which the AMP is credited.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience – The “operating experience” program element criterion in SRP-LR Section A.1.2.3.10 is:

> The operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states in LRA Section B.3.1 that each of the following leakage events described was detected prior to any significant effect on ACCW system pressure and flow.

The Unit 2 letdown heat exchanger experienced several leakage events from 2001 through 2003, resulting in the replacement of this heat exchanger in 2004. The letdown heat exchanger leaks initiated, predominantly in creviced areas of the internal baffles. All letdown heat exchanger leaks were detected prior to any loss of component intended function. Leakage rates were typically in the drops-per-minute range detected by investigation of room drain alarms.

In 2003, there was a leak in an 8-inch NPS butt weld in the return line from the letdown heat exchanger. Metallurgical examination of this weld found evidence of SCC initiated in the crevice formed by a weld backing ring.

The leakage rate was in the drops-per-minute range. Operator rounds in the auxiliary building detected the leaks.

Also in 2003, there were two leaks in socket welds in the ACCW return line from the normal charging pump motor coolers. Both of these failures were linked to high stresses from flange misalignment. One of the leaks was in a dead-ended line, the other in the main flow line. One of the leaks issued a steady stream of water well within the ACCW system makeup capacity. A walk-down of the ACCW system detected both of these leaks.

In 2004, there were two leaks in socket welds for heat exchanger drain lines for the Unit 2 ACCW heat exchangers, one leak on Train A and one on Train B, both in the drops-per-minute range. Heat exchanger walk-downs detected them. The welds were not sent offsite for metallurgical analysis, but system history suggests that SCC presumably played a role in these failures.

During the audit and review, the staff reviewed the operating experience in the LRA and operating experience reports and also interviewed the applicant's technical personnel and confirmed that plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the above plant-specific operating experience and discussions with the applicant's technical staff, the staff finds that the applicant's ACCW System Carbon Steel Components Program will adequately manage the aging effects identified in the LRA for which the AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.1, the applicant provided the UFSAR supplement for the ACCW System Carbon Steel Components Program. Also, in a letter dated June 27, 2007, the applicant provided Commitment No. 1 to implement the ACCW System Carbon Steel Components Program prior to the period of extended operation. 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 ACCW System Carbon Steel Components Program, the staff concludes that the applicant has demonstrated that 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, upon implementation through Commitment No. 1, 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), prior to the period of extended operation.

3.0.3.3.2 Bolting Integrity Program

Summary of Technical Information in the Application LRA Section B.3.2 describes the new Bolting Integrity Program as a plant-specific program.

The applicant stated that the Bolting Integrity Program manages cracking, loss of material, and loss of preload in mechanical bolted closures. The program formalizes some activities and adds new activities consolidated into an integrated program to address mechanical bolting concerns.

The Bolting Integrity Program covers safety-related and nonsafety-related bolting for pressure-retaining components within the scope of license renewal except for the reactor vessel head studs, which are addressed by the Reactor Vessel Head Closure Stud Program.

The applicant also stated that preventive aspects of the program include appropriate bolting and torquing practices, control of thread lubricants, and periodic replacement of SG manway and handhole bolting to manage cumulative fatigue damage for these fasteners. The program's bolting and torquing practices are based on industry guidelines, vendor recommendations, and plant-specific operating experience appropriate for the applications. Consistent with NUREG-1339 recommendations, the program prohibits the use of lubricants containing molybdenum disulfide, which has been specifically implicated in SCC of bolting.

The applicant further stated that the program also includes periodic inspection of closure bolting assemblies to detect signs of leakage that may indicate loss of preload, loss of material, or crack initiation. Periodic inspection of bolted closures in conjunction with the Inservice Inspection (ISI) Program and External Surfaces Monitoring Program detects the effects of aging and joint leakage. Operator rounds and system walk-downs also detect joint leakage. The Boric Acid Corrosion Control Program evaluated borated water leaks and subsequent impact on bolted connections separately.

The Bolting Integrity Program does not control material selection and manufacturing. The design process controls those activities. The Bolting Integrity Program will be implemented prior to the period of extended operation.

<u>Staff Evaluation</u> In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.2 related to the applicant's demonstration of the Bolting Integrity 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 Bolting Integrity Program against the staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Bolting Integrity Program would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program – The "scope of the program" program element criterion in SRP-LR Section A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

The applicant states in LRA Section B.3.2 that the program scope includes all mechanical discipline pressure boundary bolted connections within the scope of license renewal, except for the reactor vessel head studs which is managed by the Reactor Vessel Closure Head Stud Program. Consistent with NUREG-1339, the program considers fasteners determined to have actual yield strength values equal to or greater than 150 ksi (and which are loaded in tension) susceptible to SCC.

During the audit and review, the staff reviewed the applicant's program basis documents for this program that adequately identified all the components within the scope of this AMP. Further, the staff compared attributes of this AMP to those of GALL AMP XI.M18, "Bolting Integrity" to determine whether the plant-specific Vogtle AMP for Bolting Integrity would be effective in managing the effects of aging. The staff noted that the program descriptions for GALL AMP XI.M18 and the Vogtle Bolting Integrity AMP as augmented by the Inservice Inspection Program are equivalent because they both address the same components without exception. The staff concludes that the component supports and associated bolting, including high strength NSSS component support bolting, is within the scope of the VEGP Inservice Inspection Program. The staff finds the "scope of the program" acceptable since it specifically identifies the components within the scope of the Bolting Integrity Program and that the components are equivalent to those identified in GALL AMP XI.M18.

The staff concludes that the specific components for which the program manages aging effects are identified, which satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds the applicant's scope of the program acceptable.

(2) Preventive Actions – The "preventive actions" program element criterion in SRP-LR Section A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The applicant states in LRA Section B.3.2 that bolting and torquing practices and related guidance will be based on industry guidelines like the EPRI bolting guidelines, vendor recommendations, and plant-specific operating experience. Over the years EPRI has published various guides to design, installation, and maintenance of bolted closures: EPRI NP-5067, "Good Bolting Practices: A Reference Manual for Nuclear Power Plant Maintenance Personnel," EPRI TR-104213, "Bolted Joint Maintenance and Applications Guide," and other, more specific guidelines. At times, these guidelines are contradictory. The applicant stated that it will use guidance appropriate for VEGP applications. Control of bolt preload by good bolted-joint practices effectively minimizes the potential for SCC. Application of lubricants will be controlled to specify approved, stable lubricants. Approved lubricants lists will be updated based on new industry operating experience and research data. Consistent with NUREG-1339 recommendations, the program will prohibit the use of Molybdenum Disulfide, which has been specifically implicated in SCC of bolting. The applicant noted that detection of significant leakage during operator rounds minimizes the effects of aggressive environments. Timely detection and correction of leakage minimizes the degradation of bolted connections.

The applicant also stated that periodic replacement of SG secondary side manway and handhole bolts manages cumulative fatigue damage (LRA Section 4.3.5).

This approach ensures a conservative number of transient cycles in current fatigue analyses. The current replacement schedule of 30 years of service life may be adjusted by updated analyses initiated by the program. The Steam Generator Program strategic plan tracks replacement activity.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which described the preventive and mitigative actions that are focused on prevention of bolted joint failure through control of bolt preload and the application of good bolted joint practices to minimize the occurrence of SCC. In addition, the staff noted that only approved lubricants will be used, and that early leak detection through operator rounds will minimize the potential for bolting degradation by limiting the formation of aggressive environments. The staff noted that GALL AMP XI.M18, and the Vogtle Bolting Integrity Program both address equivalent preventive actions. Additionally, the staff noted that the Vogtle Bolting Integrity Program will direct the periodic replacement of the steam generator secondary manway and handhold bolts to manage cumulative fatigue damage and that the frequency of bolt replacement of 30 years can be modified through updated analyses. On this basis, the staff finds the "preventive actions" acceptable since they would be effective in preventing bolted joint failure.

The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected – The "parameters monitored or inspected" program element criterion in SRP-LR Section A.1.2.3.3 are:

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameters monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.3.2 that joint installation and maintenance activities monitor parameters for proper bolt torque and joint alignment. Operator rounds and visual and non-visual examinations specified by the Inservice Inspection (ISI) Program and External Surfaces Monitoring Program detect loss of preload evidenced by leakage, loss of material, and cracking.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which described the parameters monitored that include leak detection and include proper joint alignment during maintenance and operation activities. The staff finds the "parameters monitored or inspected" acceptable since it identifies the performance of inspections equivalent to those identified in GALL AMP XI.M18.

The staff concludes that this program element satisfies the criteria defined in SRP-LR Section A.1.2.3.3. The staff finds it acceptable on the basis that the applicant inspects bolted connections within scope for evidence of leakage, corrosion, and loss of preload.

In addition, this program element specifies both visual and non-visual inspection techniques in accordance with the Inservice Inspection Program and External Surfaces Monitoring Program.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects – The "detection of aging effects" program element criteria in SRP-LR Section A.1.2.3.4 are:

> Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> Describe "when," "where," and "how" program data are collected (i.e., all aspects of activities to collect data as part of the program).
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience. Provide justification, including codes and standards referenced, that the technique and frequency are adequate to detect the aging effects before a loss of SC intended function. A program based solely on detecting SC failures is not considered an effective aging management program.
>
> > When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects. The sample size should be based on such aspects of the SCs as the specific aging effect, location, existing technical information, system and structure design,

materials of construction, service environment, or previous failure history. The samples should be biased toward locations most susceptible to the specific aging effect of concern in the period of extended operation. Provisions should also be included on expanding the sample size when degradation is detected in the initial sample.

The applicant states in LRA Section B.3.2 that periodic inspections in conjunction with the following activities detect the effects of aging and joint leakage. Operator rounds periodically monitor bolted connections for signs of leakage due to loss of preload. Visual inspections detect loss of preload resulting in joint leakage and fastener degradation due to cracking or loss of material. The Inservice Inspection (ISI) Program inspects safety-related fasteners using inspection techniques specified in ASME Code Section XI, Subsections IWB, IWC, and IWD. The External Surfaces Monitoring Program inspects carbon steel, alloy steel, and copper alloy fasteners subject to loss of material using general visual examination techniques to detect leakage and corrosion of bolted closures. Inspections to detect joint leakage will focus on bolted connections in high-temperature or high-pressure service where leakage is most likely.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which adequately described that detection of aging effects include periodic inspections and that the safety-related bolted fasteners are subject to the appropriate inspections techniques as specified in ASME Code Section XI. The staff finds the "detection of aging effects" acceptable since it identifies the performance of inspections equivalent to those identified in GALL AMP XI.M18.

This program element satisfies the SRP-LR Section A.1.2.3.4 because it specifies that visual and non-visual inspections are performed which can detect the aging effects and that the frequency of inspection ensures that the aging effects will be detected prior to the loss of component function. Also, the applicant's Bolting Integrity Program does not utilize sampling as all bolted connections are subject to inspection.

The staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending – The "monitoring and trending" program element criteria in SRP-LR Section A.1.2.3.5 are:

Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.

This program element should describe "how" the data collected are evaluated and may also include trending for a forward look. This

> includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function. The parameter or indicator trended should be described. The methodology for analyzing the inspection or test results against the acceptance criteria should be described.

The applicant states in LRA Section B.3.2 that operations department personnel periodically conduct rounds of accessible areas. The engineering staff also conducts system walk-downs periodically. ISI program inspection frequencies are established consistent with ASME Code Section XI as specified by 10 CFR 50.55a(g)(4)(ii). The applicant also stated that the Inservice Inspection (ISI) Program is based on ASME Code Inservice Inspection Program B (IWA-2432). Owner activity reports record ISI results for the staff after each operating cycle. The External Surfaces Monitoring Program conducts general visual inspections periodically of both normally accessible and normally inaccessible areas. Inspection intervals will be consistent with those specified by the External Surfaces Monitoring Program.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which adequately described that monitoring and trending activities include periodic inspections through conducting rounds of accessible areas and that engineering staff conducts system walk-downs on a periodic basis.

The staff concludes that this program element satisfies the criteria defined in the SRP-LR Section A.1.2.3.5 on the basis that the program describes the specific inspection activities, the frequency of performance, and the method of their documentation. Additionally, the program describes the actions taken to evaluate the acceptability of inspection results.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria – The "acceptance criteria" program element criteria in SRP-LR Section A.1.2.3.6 are:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The applicant states in LRA Section B.3.2 that any significant joint leakage detected during operator rounds or system walkdowns is unacceptable and it is entered into the corrective actions process. For inspection of safety-related fasteners under the Inservice Inspection (ISI) Program, acceptance standards will be consistent with those as defined in ASME Code Section XI Articles IWA-3000, IWB-3000, IWC-3000, and IWD-3000. For unacceptable conditions identified during general visual inspections conducted by the External Surface Monitoring Program, indications of joint leakage, cracking, or significant corrosion of fasteners or joint mating surfaces are entered into the corrective action process.

During the audit and review, the staff reviewed the applicant's program basis documents for this program which adequately described that the acceptance criteria included those specified in ASME Code Section XI for safety-related fasteners and equivalent criteria for nonsafety-related fasteners.

The staff concludes that this program element satisfies the criteria in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable on the basis that the acceptance criteria are consistent with ASME Section XI articles IWA-3000, IWB-3000, IWC-3000, and IWD-3000. Further, any evidence of joint leakage, cracking, or significant corrosion is reported and documented in the VEGP corrective actions process.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience – The "operating experience" program element criterion in SRP-LR Section A.1.2.3.10 is:

> The operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states in LRA Section B.3.2 that industry operating experience shows that bolted connections typically do not fail catastrophically but are more likely to leak. Additionally, complete joint failure is unlikely due to the redundancy of multiple fasteners. The applicant stated that degradation of bolted connections in the industry has been related primarily to boric acid corrosion (addressed by the Boric Acid Corrosion Control Program), out-of-specification fasteners, and recurring leakage events. Recent plant-specific operating experience with fasteners includes leakage due to loss of preload, corrosion of fasteners in environments with wetting or condensation effects, loose or improperly torqued fasteners, and missing fasteners and locking pins. Some carbon steel and alloy steel bolting has been replaced with corrosion-resistant material. Maintenance to correct leaks also has detected minor scratching and corrosion of flange surfaces. The applicant also stated that these results indicate that the redundancy of bolted connections with Inservice Inspection (ISI) Program inspections and system walkdowns have detected degradation effectively prior to the loss of any intended function. There have been no reports of bolt cracking due to SCC in recent experience.

The applicant further stated that the Bolting Integrity Program is based on industry practices and vendor recommendations for bolted connection installation and maintenance. Program updates will incorporate new guidance applicable to VEGP.

During the audit and review, the staff reviewed the operating experience provided in the LRA and operating experience evaluation reports, and also interviewed the applicant's technical personnel and confirmed that plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff concludes that these operating experience events provide objective evidence that the Bolting Integrity Program will provide timely detection of aging degradation and corrective action.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Bolting Integrity Program will adequately manage the aging effects identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.2, the applicant provided the UFSAR supplement for the Bolting Integrity Program. Also, in a letter dated June 27, 2007, the applicant provided Commitment No. 2 to implement the Bolting Integrity Program prior to the period of extended operation. The staff reviewed the UFSAR Supplement section and finds the UFSAR supplement information provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

<u>Conclusion</u> On the basis of its review of the applicant's Bolting Integrity Program, the staff concludes that the applicant has demonstrated that 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, upon implementation through Commitment No. 2, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.3 Diesel Fuel Oil Program

<u>Summary of Technical Information in the Application</u> LRA Section B.3.7 describes the existing Diesel Fuel Oil Program as a plant-specific program.

The applicant stated that the Diesel Fuel Oil Program manages loss of material in the diesel fuel oil systems for the emergency diesel generators (EDGs) and diesel engine-driven fire water pumps by monitoring and maintenance of diesel fuel oil quality. The program is based on VEGP Technical Specifications and supplemental requirements. Draining, cleaning, and internal condition inspections of diesel fuel oil components under other AMPs are as follows:

- The Periodic Surveillance and Preventive Maintenance Program periodically cleans and inspects the EDG system diesel fuel oil storage tank interiors.

- The Fire Protection Program visually inspects diesel engine-driven fire water pump fuel supply lines for leakage during diesel operation as a part of surveillance testing.

- The One-Time Inspection Program verifies the effectiveness of the Diesel Fuel Oil Program at preventing loss of diesel fuel oil component material by sampling inspections focused on locations like tank bottoms where contaminants may accumulate. The inspections measure storage tank bottom surface thickness to confirm that significant degradation has not occurred.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.7 on the applicant's demonstration of the Diesel Fuel Oil 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 Diesel Fuel Oil Program against the staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Diesel Fuel Oil Program would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program – The "scope of the program" program element criterion in SRP-LR Section A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

The applicant states in LRA Section B.3.7 that the Diesel Fuel Oil Program is credited for license renewal to manage loss of material due to corrosion on surfaces exposed to diesel fuel oil in the following systems:

- EDG system
- Fire protection system (diesel engine-driven fire water pumps)

The applicant also stated that the program monitors and maintains diesel fuel oil quality in the diesel fuel oil systems for the EDGs and diesel engine-driven fire water pumps. For license renewal, the program focus is to manage conditions that can cause loss of material in system components by monitoring and maintaining diesel fuel oil quality in the storage tanks. Fuel oil monitoring activities that minimize the potential for degradation of the coating system on the interior of EDG system diesel fuel oil storage tanks are within the scope of the program.

The staff concludes that the specific components (EDGs and diesel engine-driven fire water pumps) for which the program manages aging effects are identified. The staff finds that this satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds the applicant's scope of the program acceptable.

The staff confirmed that the "scope of the program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions – The "preventive actions" program element criterion in SRP-LR Section A.1.2.3.2 states that the activities for prevention and mitigation programs should be described and that these actions should mitigate or prevent aging degradation.

The applicant states in LRA Section B.3.7 that, when necessary based on the results of microbe and stability analyses, biocides and fuel oil stabilizers are added. In addition, the staff noted during the audit and review that the program periodically monitors the presence of water in the bottom of the EDG diesel fuel oil tanks and, if present, drains the water from the bottom of the tank to minimize the potential for corrosion of the tank.

The staff finds this acceptable because the program is primarily a condition monitoring program which has provisions for preventive measures (addition of fuel additives and draining of the accumulated water), if the results of periodic testing indicate that it is warranted.

The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected – The "parameters monitored or inspected" program element criterion in SRP-LR Section A.1.2.3.3 are:

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameters monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.3.7 that prior to offloading to the EDG diesel fuel oil storage tanks, fuel oil in tanker cars is bottom-sampled. When the tanker has multiple compartments, the program uses a composite sample of proportionate volumes from each compartment. Bottom sampling of new fuel oil conservatively measures fuel oil contaminants like water and sedimentation.

Before the addition of fuel oil to the EDG diesel fuel oil storage tanks, the applicant stated that the program analyzes oil for the following parameters for aging management:

- Clear and bright appearance in accordance with ASTM Test Method D4167,

- Mercaptan sulfur content in accordance with ASTM Test Methods D3227 or D484; and

- Neutralization number in accordance with ASTM Test Method D664.

Before addition to the diesel fuel oil tanks for the diesel engine-driven fire water pumps, or within 72 hours after fuel addition, the program tests the fuel oil for a clear and bright appearance in accordance with ASTM Test Method D4167.

In accordance with VEGP Technical Specifications, the applicant also stated that the program analyzes samples collected prior to offload to the EDG diesel fuel oil storage tanks for the parameters specified in Table 1 of ASTM D975 (1981) within 31 days after addition of the sampled fuel oil to the tanks. For aging management, the program credits the following parameters from this analysis to manage the effects of aging:

- Water and sediment content consistent with ASTM Test Method D1796 or D2709.

- Copper Strip Corrosion analyzed consistent with ASTM Test Method D130.

The applicant further stated that the program monitors fuel oil stored in the EDG fuel oil storage tanks for the following parameters for aging management:

- Check for and remove accumulated water,

- Using a recirculated tank sample, total particulate content consistent with ASTM Test Method D6217 (this method uses a 0.8 micron filter),

- Using a recirculated tank sample, mercaptan sulfur content consistent with ASTM Test Method D3227 or D484,

- Using a recirculated tank sample, neutralization number in accordance with ASTM Test Method D664, and;

- Using a recirculated tank sample, microbe and stability analyses are performed.

Fuel oil mercaptan sulfur and neutralization number testing address the potential for aggressive conditions that could affect the coating applied to the internal surfaces of the EDG diesel fuel oil storage tanks.

The program analyzes the stored fuel oil in the diesel fuel oil tanks for the diesel engine-driven fire water pumps for a clear and bright appearance using a composite sample from the storage tank.

The staff finds this program element acceptable because the program monitors the quality of the fuel oil to detect the presence of contaminants in water and sediments that could cause the identified aging effects. In addition, the program provides for testing the fuel oil for the presence of Mercaptan sulfur and neutralization number which could affect the coating applied to the internal surfaces of the EDG fuel oil storage tanks. Finally, the program monitors the particulate level in the fuel oil which is an indicator of the effectiveness of the program in managing the degradation of the surfaces exposed to diesel fuel oil. On this basis, the staff finds the applicant's parameters monitored or inspected program element acceptable.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects – The "detection of aging effects" program element criteria in SRP-LR Section A.1.2.3.4 are:

> Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
>> Describe "when," "where," and "how" program data are collected (i.e., all aspects of activities to collect data as part of the program).
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience. Provide justification, including codes and standards referenced, that the technique and frequency are adequate to detect the aging effects before a loss of SC intended function. A program based solely on detecting SC failures is not considered an effective aging management program.
>
> When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The applicant states in LRA Section B.3.7 that degradation of fuel oil system components cannot occur without fuel oil contaminants like water, sediment, or microbiological organisms. The program minimizes degradation of the EDG fuel oil storage tank interior coating system by monitoring Mercaptan sulfur and neutralization number as indicators of fuel oil condition. Periodic sampling, analysis, and appropriate corrective actions assure that fuel oil contaminants have not impacted fuel oil system components adversely.

The applicant also stated that detection of loss of material in internal surfaces of fuel oil system components is through activities and inspections under other AMPs. These inspection activities include the following visual and volumetric examination techniques:

- For the EDG diesel fuel oil storage tanks, visual inspection of the internal tank surfaces for degradation of the applied coating and corrosion of the tank base metal is under the Periodic Surveillance and Preventive Maintenance Activities Program.

- Visual monitoring of the fuel supply lines for the diesel engine-driven fire water pumps for leakage indicative of component degradation during diesel operation is part of the surveillance testing under the Fire Protection Program.

- The One-Time Inspection Program monitors the effectiveness of the Diesel Fuel Oil Program at preventing loss of material in the diesel fuel oil components by sampling inspections focused on locations like tank bottoms where contaminants may accumulate. The inspections measure storage tank bottom surface thickness to confirm that significant degradation has not occurred.

The staff finds this program element acceptable on the basis that the program monitors the presence of fuel oil contaminants that could result in the degradation of the fuel oil system components. The program also monitors the Mercaptan sulfur and neutralization number as an indicator of the aggressiveness of the fuel oil which minimizes the potential for degradation of the coating on the surface of the EDG fuel oil storage tanks.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending – The “monitoring and trending” program element criteria in SRP-LR Section A.1.2.3.5 are:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> This program element should describe how the data collected are evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

The applicant states in LRA Section B.3.7 that the program monitors EDG system stored fuel oil periodically as follows:

- Consistent with VEGP Technical Specifications, the program checks for and removes accumulated water every 31 days.

- Consistent with VEGP Technical Specifications, the program monitors total particulate every 31 days.

- Mercaptan sulfur and neutralization number are monitored quarterly.

- The program analyzes diesel engine-driven fire water pump stored diesel fuel oil for a clear and bright appearance quarterly.

The staff finds this program element acceptable on the basis that the program monitors the presence of fuel oil contaminants on a frequency which is consistent with the VEGP Technical Specifications and less than on a quarterly basis as recommended in GALL AMP XI.M30, "Fuel Oil Chemistry." The program also monitors the Mercaptan sulfur and neutralization number on a quarterly basis, which is consistent with GALL AMP XI.M30 and acceptable.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria – The "acceptance criteria" program element criteria in SRP-LR Section A.1.2.3.6 are:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The applicant states in LRA Section B.3.7 that the EDG system new fuel oil acceptance criteria are as follows:

- New fuel oil must have a clear and bright appearance in accordance with ASTM Test Method D4167.

- Mercaptan sulfur content must be less than 0.01 percent if stored oil Mercaptan content is greater than 0.007 percent or the offload exceeds 15,000 gallons added to the storage tank since the last Mercaptan analysis where Mercaptan content was less than 0.007 percent.

- Neutralization number must be less than 0.2.

- Water and sediment content analyzed in accordance with ASTM Test Method D1796 must be less than 0.05 percent.

- Water and sediment content analyzed in accordance with ASTM Test Method D2709 must meet method criteria.

- Copper strip corrosion analyzed in accordance with ASTM Test Method D130 must be No. 3 or less.

- Before addition to the diesel fuel oil storage tank for the diesel engine-driven fire water pumps, or within 72 hours after fuel oil addition, the program tests the fuel oil for a clear and bright appearance in accordance with ASTM Test Method D4167.

EDG system stored fuel oil acceptance criteria are as follows:

- Any indication of accumulated water is unacceptable.
- Total particulate must be less than 10 mg/liter.
- Mercaptan sulfur content must be less than 0.01 percent.
- Neutralization number must be less than 0.2.
- Microbe analyses must not indicate significant presence.
- Stability analyses must not indicate any significant breakdown of the fuel.

Stored fuel oil for the diesel engine-driven fire water pumps must have a clear and bright appearance.

The staff finds this program element acceptable on the basis that the program identifies specific acceptance criteria for the parameters against which the need for corrective actions are evaluated. On this basis, the staff finds the applicant's acceptance criteria program element acceptable.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience – The "operating experience" program element criterion in SRP-LR Section A.1.2.3.10 is:

> The operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states in LRA Section B.3.7 that the Diesel Fuel Oil Program is in accordance with general requirements for environmental and engineering programs. Periodic program reviews ensure compliance with regulatory, process, and procedural requirements. There has been no significant degradation of EDG fuel oil system or fire pump diesel fuel oil system components. A recent 10-year cleaning and inspection of the EDG Fuel Oil Storage Tanks observed only minimal amounts of sludge and no damage to the inorganic zinc coating or the underlying tank base metal. Recent plant-specific operating experience shows no significant or recurring problems in diesel fuel oil test results and only two minor test failures. In 2002 a check for accumulated water detected and removed a small quantity of water from the 1A Emergency Diesel Fuel Oil Storage Tank. In 2003, a clear and bright test detected high solids in the No. 5 Fire Pump Diesel Fuel Oil Storage Tank. After circulation through a portable filtration system the tank contents passed a follow-up clear and bright test.

The applicant further stated that the condition of the fuel oil storage tanks and other components and the early detection of fuel oil quality issues by fuel oil sampling demonstrate that the program effectively manages degradation of surfaces exposed to diesel fuel oil.

During the audit, the staff confirmed in discussions with the applicant's technical staff and review of VEGP operating experience report evaluation that no significant aging degradation in the EDG fuel oil system or fire pump diesel fuel oil system components has been identified to date. In addition, the staff confirmed that, during the last 10-year tank cleaning and inspection of the EDG fuel oil storage tanks, no damage to the inorganic zinc coating or the underlying tank base metal was observed. On this basis, the staff finds that the applicant's operating experience acceptable.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.7, the applicant provided the UFSAR supplement for the Diesel Fuel Oil 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 Diesel Fuel Oil Program, the staff concludes that the applicant has demonstrated that 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.4 Inservice Inspection Program

Summary of Technical Information in the Application LRA Section B.3.13 describes the existing Inservice Inspection Program as a plant-specific program.

The applicant stated that the Inservice Inspection (ISI) Program mandates examinations, testing, and inspections of components and systems to detect deterioration and manage aging effects. The program uses periodic visual, surface, and volumetric examination and leakage tests of Classes 1, 2, and 3 pressure-retaining components, their attachments, and their supports to detect and characterize flaws.

The applicant also stated that the program is in accordance with 10 CFR 50.55(a), which ISI requirements of ASME Code Section XI for Classes 1, 2, and 3 pressure-retaining components, their integral attachments, and their supports. Inspection, repair, and replacement of these components are covered in Section XI Subsections IWB, IWC, IWD and IWF, respectively.

In accordance with 10 CFR 50.55a(g)(4)(ii) and as based on ASME ISI Program B (IWA-2432), the ISI Program is updated at the end of each 120-month inspection interval to the latest code edition and addenda specified in 10 CFR 50.55a twelve months before the start of the inspection interval. The ISI Program second inspection interval ended in May 2007.

The third ISI interval requirements are based on ASME Code Section XI, 2001 Edition and 2002 and 2003 Addenda.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.13 on the applicant's demonstration of the ISI 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 staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Inservice Inspection Program would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following eight (8) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," (7) "corrective actions," and (10) "operating experience."

The applicant indicated that program elements (8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluates the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program - LRA Section B.3.13 states that the following ASME Code Section XI inspection categories are credited for license renewal:

- All applicable Subsection IWB examination categories except B-N-1 and B-N-2. The Reactor Internals Program manages aging of the reactor internals.
- Subsection IWC examination categories applicable to the Model F SGs
- Subsection IWC and IWD visual examinations credited as parts of the ACCW System Carbon Steel Components Program, Bolting Integrity Program, Boric Acid Corrosion Control Program, and External Surfaces Monitoring Program
- All applicable Subsection IWF examination categories for component supports and bolting, including high-strength nuclear steam supply system component support bolting

SRP-LR Section A.1.2.3.1, "scope of program," provides the following recommendation for AMP "scope of program" program elements:

> The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.

The staff reviewed the license renewal basis evaluation document, SNC-corporate and VEGP-specific implementation procedures and 10-Year ISI Plan for the VEGP units as part of its review of the ISI Program to determine how the "scope of program" program element for the ISI Program compared with the staff's recommendations in SRP-LR Section A.1.2.3.1. From its review of these documents, the staff concludes that the ISI Program is implemented to comply with the requirements of Section §50.55a of Title 10, *Code of Federal Regulations.*

The GALL Report, Revision 1, Volume 2 recommends that a plant's ISI program be credited for aging management under 10 CFR Part 54 only for specific ASME Code Class 1 and 2 components that are identified in the specific AMR items in the report. The staff noted that the scope of the ISI Program credited for aging management in accordance with the requirements of 10 CFR Part 54 did not include all of the ASME Code Class 2 and 3 systems, components, and supports that the program that is implemented for compliance with the requirements of 10 CFR 50.55a. The staff sought further clarification on this matter and asked the applicant to:

- clarify whether the scope of the Reactor Internals Program covers all ASME inspection item requirements in the ASME Code Section XI, Table IWB-2500-1 for Examination Categories B-N-1 and B-N-2.

- provide its basis why the "scope of program" program element does not credit ASME Code Section XI, Subsection IWC for remaining ASME Class 2 systems at VEGP (i.e., for those VEGP Class 2 systems that are not part of the VEGP Model F steam generators)

- clarify which of the ASME Section XI Examination Categories and Inspection Items are within the scopes of the ACCW System Carbon Steel Components Program (Appendix B.3.1), Bolting Integrity Program (Appendix B.3.2), Boric Acid Corrosion Control Program (Appendix B.3.3), and External Surfaces Monitoring Program (Appendix B.3.8). Clarify whether the collective scope of these AMPs includes all visual examination-based inspection items in ASME Section XI Table IWC-2500-1 for VEGP Class 2 components and in ASME Section XI Table IWD-2500-1 for VEGP Class 3 components.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the scope of ISI Program is broader than the set of inspections explicitly credited for license renewal and that SNC will replace the ISI Program scope description in Section B.3.13 of the VEGP LRA with the following:

The ISI program scope is defined by ASME Section XI Subsections IWB-1000, IWC-1000, IWD-1000, and IWF-1000 for Class 1, 2, and 3 components and supports, and includes all pressure-retaining components and their integral attachments.

The applicant stated that the program description would be amended to reflect this clarification in a future LRA amendment. The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008.

The applicant also provided specific clarifications on the ASME Code Section XI Examination Categories that are credited for aging management activities of the ASME Code Class 1, 2, and 3 components and components supports at VEGP and on the ASME Code Section XI Examination Categories that are implemented for aging management purposes as part of the program element criteria for the following LRA AMPs:

- AMP B.3.1, ACCW System Carbon Steel Components Program
- AMP B.3.2, Bolting Integrity Program
- AMP B.3.3, Boric Acid Corrosion Control Program
- AMP B.3.24, Reactor Internals Program

The applicant also stated that the program description and the program elements for the ISI program contained two errors:

(1) AMP B.3.8, External Surfaces Monitoring Program, was inadvertently listed as an AMP that credits ASME Code Section XI Examination categories requirements as part of its program element criteria.

(2) The "scope of program" program element for the ISI program inadvertently listed the ASME Code Section XI Examinations Categories for the AMP B.3.24 to be Examination Categories B-N-1 and B-N-2 and that instead it should have credited Examination Category B-N-3.

The applicant stated these errors in the application would be corrected and that the corrections would be reflected in a future LRA amendment. The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008.

The applicant provided additional details on the ASME Code Section XI Examination Categories that are used for aging management in a supplemental response in the letter dated February 8, 2008. In this response, the applicant stated that Section 2 of the VEGP LRA provides a listing of VEGP systems within the scope of license renewal, and that the system within the scope of license renewal for meeting the scoping criteria of 10 CFR 54.4(a)(1) include all systems and components that are categorized as ASME Safety Class 1, 2, or 3, and that all of these systems and components fall under the scope of the VEGP ISI Program as implemented for compliance with the requirements of 10 CFR 50.55a.

The staff also noted that the LR basis evaluation document stated that the program updates the code of record to the latest one endorsed in 10 CFR 50.55a one year prior to entering the next 120 month ISI interval for the facility and that the VEGP units just entered their 3rd 10-year ISI intervals starting in May 31, 2007. The LR basis evaluation document also stated that the code of record for the 3rd 10-Year ISI Interval is the 2001 edition of Section XI inclusive of the 2003 addenda. The staff concludes that this is the same as the recommended edition of the ASME Code Section XI referenced in GALL XI.M1 and is acceptable.

The staff finds this program element acceptable because the applicant has provided clarification that: (1) which ASME Code Class systems and ASME Code Section XI Examinations Categories are within scope of the ISI Program for the purpose of complying with the requirements of 10 CFR 50.55a, (2) which of the ASME Code Class systems and ASME Code Section XI Examination Categories are implemented for compliance with 10 CFR 50.55a and which systems and ASME Code Section XI Examination Categories are within the scope of the applicant's ISI Program, credited for aging management in accordance with the requirements of 10 CFR Part 54, and (3) which edition of the ASME Code Section XI is currently in effect for VEGP Units 1 and 2. The staff's questions on the "scope of program" program element are resolved. Based on this evaluation, the staff confirmed that the "scope of the program" program element satisfies the criterion defined in the SRP-LR Section A.1.2.3.1.

(2) Preventive Actions - LRA Section B.3.13 states that the condition-monitoring ISI Program does not include preventive actions.

SRP-LR Section A.1.2.3.2, "preventive actions" provides, in part, the following NRC guideline recommendations for AMP "preventative actions" program elements in plant-specific LRAs:

> The activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation.
>
> For condition or performance monitoring programs, they do not rely on preventive actions and thus, this information need not be provided. More than one type of aging management program may be implemented to ensure that aging effects are managed.

The ISI Program is defined as a condition monitoring program for the VEGP LRA and the program does not include specific criteria to mitigate or prevent aging effects from occurring in ASME Code Class systems because required ISI inspection criteria, flaw evaluation acceptance criteria, and corrective action and repair/replacement criteria in the ASME Code Section XI do not include specific criteria for mitigation or prevention of aging effects in ASME Code Class systems. Based on this assessment, the staff agrees that the ISI Program does not need to include preventive actions that corresponds to applicable "preventive actions" program element defined in SRP-LR Section A.1.2.3.2 because the AMP is a condition monitoring program and does not include activities to preclude or mitigate aging effects from occurring.

The staff confirmed that the ISI Program does not need to include a program element that satisfies the “preventive actions” program element the criterion defined in the in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.3.13 states that the ISI Program detects degradation in components crediting the program by inspection techniques specified in ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF.

SRP-LR Section A.1.2.3.3, “parameters monitored or inspected” provides the following recommendation for “parameters monitored or inspected” program elements for condition monitoring-based AMPs:

> For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. Some examples are measurements of wall thickness and detection and sizing of cracks.

The staff reviewed the license renewal basis evaluation document, SNC-corporate and VEGP-specific implementation procedures and 10-Year ISI Plan for the VEGP units as part of its review of the ISI Program to determine how the “parameters monitored or inspected” program element for the ISI Program compared with the staff’s recommendations in SRP-LR Section A.1.2.3.3. From its review of these documents, the staff concludes that the “parameters monitored or inspected” program element discussion in the LR basis evaluation document stated that the ISI Program is a condition monitoring program and that this AMP monitors for aging effects that can be induced by age-related degradation mechanisms, including those mechanical and chemical mechanisms that can induce cracking and loss of material in ASME Code Class components, and loss of preload in ASME Code Class mechanical connections (i.e., bolted connection assemblies or mechanical assemblies using keys or other fasteners). The staff concludes that aging effects are consistent with those identified in the “parameters monitored” program element in GALL AMP XI.M1, “ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF.”
This is acceptable because it conforms to the aging effects that GALL AMP XI.M1 recommends for monitoring.

The staff also noted that the program manages loss (reduction) of fracture toughness in those ASME Code Class pump casings and valve bodies that are made from cast austenitic stainless steel (CASS) and operate at temperatures greater than or equal to 482˚F. The applicant’s program element discussion stated that, for these components, the visual examinations proposed under the ASME Code Section XI are adequate for these flaw-tolerant components. The staff concludes that this is consistent with both the guidance in GALL AMP XI.M1, “ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF,” and in the NRC’s guidelines on thermal aging of CASS components, which are described in the Christopher Grimes letter dated May 19, 2000, “License Renewal Issue 98-0030, ‘Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Components’”.

This is acceptable because it conforms to the NRC's recommended guidelines for managing loss of material due to thermal aging in CASS pump casings and valve bodies.

Based on this evaluation, the staff concludes that the "parameters monitored or inspected" program element is acceptable because the aging effects that the program monitors for are consistent with either those identified in AMP XI.M1 of the GALL Report or in NRC-issued LR guidance documents (i.e. in the Chris Grimes letter of May 19, 2000).

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.3.13 states that the ISI Program uses nondestructive examination techniques as specified in ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF, to detect and characterize component flaws. Volumetric (*e.g.*, radiographic, ultrasonic, or eddy current) examinations detect and characterize surface and subsurface flaws. Examinations comply with the performance demonstration initiative based on ASME Code Section XI Appendix VIII, 2001 Edition, as mandated by 10 CFR 50.55a. Surface examinations (*e.g.*, magnetic particle or dye penetrant testing) detect surface flaws. There are three specified levels of visual examination. VT-1 visual examination detects cracks and symptoms of wear, corrosion, erosion, or physical damage on the surface of the component; VT-1 can use either direct visual or remote examination by various optical and video devices. VT-2 visual examination locates evidence of leakage from pressure-retaining components. VT-3 visual examination determines general mechanical and structural condition of components and supports and detects discontinuities and imperfections.

SRP-LR Section A.1.2.3.4, "detection of aging effects" provides the following recommendation for "detection of aging effects" program elements for condition monitoring-based AMPs:

> Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects. Provide information that links the parameters to be monitored or inspected to the aging effects being managed.

The staff reviewed the license renewal basis evaluation document, SNC-corporate and VEGP-specific implementation procedures and 10-Year ISI Plan for the VEGP units as part of its review of the ISI Program to determine how the "detection of aging effects" program element for the ISI Program compared with the staff's recommendations in SRP-LR Section A.1.2.3.4.

From its review of these documents, the staff concludes that the “detection of aging effects” program element discussion in the LR basis evaluation document stated that the ISI Program implements the non-destructive examination (NDE) techniques of the ASME Code Section XI and that these techniques include volumetric examination methods, including ultrasonic testing (UT), radiography testing (RT) or eddy current testing (ET), and surface examination methods, including magnetic particle testing (MT), dye-penetrant testing (PT) and eddy current testing (ET). The staff noted that the LR basis evaluation document stated that UT, RT, and ET volumetric examination techniques mentioned in the previous sentence are capable of detecting and characterizing both surface-breaking flaws and subsurface flaws, and that the PT and MT surface examination techniques are capable of detecting surface flaws. The staff also noted that the applicant’s “detection of aging effects” program element includes a sufficient clarification on the aging effects that the UT, RT, ET, PT, and MT non-visual examination techniques are capable of detecting. This provides the relevant information linking the parameters being monitored for to the aging effects being managed, as recommended in SRP-LR Section A.1.2.3.4.

The staff also determined, from its review of the LR basis evaluation document, it stated that the ISI Program includes visual examination techniques as follows: (1) VT-1 visual examination methods are capable of detecting discontinuities and imperfections in the surfaces of the components, including evidence of cracks, corrosion, erosion, or wear, (2) VT-2 visual examination methods are conducted during system pressure tests or system leakage tests, with or without the use of leakage collection systems, to detect evidence of leakage from ASME Code Class pressure retaining components, and (3) VT-3 visual examination methods are conducted to determine the general mechanical or structural condition of components and their supports, to verify design parameters such as clearances, settings, to monitor for physical displacements of ASME Code Class components, and to detect discontinuities and imperfections, such as loss of integrity at bolted connections, loose or missing parts, debris, corrosion, erosion, or wear.

The staff noted that the visual VT-1, VT-2, and VT-3 NDE methods referenced in the LRA and the LR basis evaluation document are equivalent to those referenced in Article IWA-2000 of the ASME Code Section and are consistent with those recommended in “detection of aging effects” program element of GALL AMP XI.M1, ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF,” and that the applicant’s “detection of aging effects” program element includes a sufficient clarification on those aging effects that the specific visual VT-1, VT-2, and VT-3 examination techniques are capable of detecting. This provides the relevant information linking the parameters being monitored for to the aging effects being managed, as recommended in SRP-LR Section A.1.2.3.4.

The basis document states that the inspection techniques are prescribed by the ASME Code Section XI or are as specified in 50.55a and that the inspection techniques have been developed in accordance with industry consensus process. The staff has evaluated the ability of the ASME Code Section XI inspection techniques to detect relevant aging in the evaluation of the “detection of aging effects” program element for this AMP. The basis document clarifies that in some cases the techniques are qualified in accordance with the performance demonstration initiative (PDI) project. The NRC's PDI requirements in 10 CFR 50.55a are mandated to ensure that ultrasonic testing techniques are appropriately qualified to be capable of monitoring for, detecting and sizing relevant flaw indications.

The staff concludes that using the PDI is acceptable to qualify the UT examination techniques for their ability to monitor for, detect, and size relevant surface-breaking and subsurface flaw indications because the applicant's PDI qualifications are performed in accordance with the applicable PDI requirements of 10 CFR 50.55a, which the NRC has established as acceptable qualification requirements for volumetric examination technique monitoring, detection and sizing capabilities.

Based on this review, the staff concludes that the both the non-visual and visual examination techniques for the ISI Program are acceptable because they are consistent with the non-visual and visual examinations techniques recommended for implementation in GALL AMP XI.M1, ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF," and because the applicant has clarified how the volumetric inspection techniques for the ISI Program are qualified for use in accordance with the applicant's PDI process and the PDI initiative requirements in 10 CFR 50.55a. The staff also determined that the applicant's discussion of both the non-visual and visual examination techniques in the "detection of aging effects" program element for the ISI Program conforms to recommended criteria in the SRP-LR Section A.1.2.3.4, because it provides the relevant information linking the examination techniques used for monitoring to the parameters and aging effects being monitored for by these techniques.

Based on this evaluation, the staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.3.13 states that ISI Program inspection frequencies for each inspection interval are consistent with ASME Code Section XI as specified in 10 CFR 50.55a(g)(4)(ii). The program, based on ASME Code ISI Program B (IWA-2432), compares results to baseline data and other previous test results and evaluates indications in accordance with ASME Code Section XI. If the component qualifies by analytical evaluation as acceptable for continued service, subsequent inspections reexamine the area of the indication. Indications that exceed acceptance standards are extended to additional examinations in accordance with ASME Code Section XI. Owner activity reports record ISI Program results for the staff after each refueling outage.

SRP-LR Section A.1.2.3.5, "monitoring and trending" provides the following recommendation for the "monitoring and trending" program elements for preventative/mitigative-based, condition monitoring-based, and performance-monitoring-based AMPs:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.

Plant specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.

This program element describes "how" the data collected are evaluated and may also include trending for a forward look. This includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function. Although aging indicators may be quantitative or qualitative, indicators should be quantified, to the extent possible, to allow trending. The parameter or indicator trended should be described. The methodology for analyzing the inspection or test results against the acceptance criteria should be described. Trending is a comparison of the current monitoring results with previous monitoring results in order to make predictions for the future.

The staff reviewed the license renewal basis evaluation document, SNC-corporate and VEGP-specific implementation procedures and 10-Year ISI Plan for the VEGP units as part of its review of the ISI Program to determine how the "monitoring and trending" program element for the ISI Program compared with the staff's recommendations in SRP-LR Section A.1.2.3.5.

The staff noted, from its review of the LR basis evaluation document, that the applicant establishes its inspection frequencies and sample sizes for the ASME Code Section XI inspections that are implemented under this program in accordance with the frequency and sample size criteria of the inspection items that are defined in the applicable ASME Code Section XI Examination Categories. The staff also noted that, in its response letter dated February 8, 2008 the applicant stated and defined which ASME Code Examination Categories are credited for aging management in the applicant's response to the staff's question on scoping of systems and Examinations Categories for this AMP. The staff provided its basis for accepting those ASME Code Section XI Examination Categories credited for aging management in its evaluation of the "scope of program" program element for this AMP. Based on this evaluation, the staff concludes that the applicant has established acceptable inspection frequencies and sample sizes for those ASME Code Section XI inspection items that are credited for aging management because they are defined in the applicable ASME Code Section Examination Categories that have been credited for aging management and approved in the staff's evaluation of the "scope of program" program element for this AMP.

The LR basis evaluation document also indicated that the program calls for the results of the examinations to be recorded and compared to baseline data and data from other previous inspection results. The LR basis evaluation document also indicated that, if the results indicate the presence of relevant flaw indications in an ASME Code Class components and the flaw size is within the acceptable flaw size limit of the applicable ASME Code Section XI flaw acceptance standard, the component is re-examined during subsequent refueling outages. The staff concludes that this is acceptable because: (1) it is in compliance with applicable evaluation and trending requirements in the ASME Code Section XI Articles IWB-

3000, IWC-3000, and IWD-3000 for ASME Code Class 1, 2, and 3 components, (2) the followup examinations during the subsequent refueling outages will provide for further assessment of the flaw indications to determine whether unacceptable flaw growth is occurring in the impacted component, and because these trending activities are in conformance with the NRC's recommendation in GALL AMP XI.M1 that the inspection results for ASME Code Class components be evaluated and trended in accordance the applicable ASME Section XI requirements.

The staff also determined that the applicant's "monitoring and trending" program element for the ISI Program conforms to recommended criteria in the SRP-LR Section A.1.2.3.5, because it provides a sufficient clarification on how the frequencies and sample sizes for the non-visual and visual examinations are established and how the program collects and trends that data from these examinations and evaluates them against applicable acceptance criteria for these examination methods, as established in the ASME Code Section XI.

Based on this evaluation, the staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.3.13 states that a pre-service, or baseline, inspection of program components prior to startup assured both an absence of defects greater than code-allowable and a basis for evaluation of subsequent ISI results compared, as appropriate, to baseline data, other previous test results, and ASME Code Section XI acceptance standards. ISI program acceptance standards are defined in ASME Code Section XI Articles IWA-3000, IWB-3000, IWC-3000, IWD-3000, and IWF-3000.

SRP-LR Section A.1.2.3.6, "monitoring" provides the following recommendation for the "acceptance criteria" program elements for preventative/mitigative-based, condition monitoring-based, and performance-monitoring-based AMPs:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria, and insure corrective action is taken, such as piping replacement, before reaching this acceptance criterion. This acceptance criterion should provide for timely corrective action before loss of intended function under these CLB design loads.
>
> Acceptance criteria could be specific numerical values, or could consist of a discussion of the process for calculating specific numerical values of conditional acceptance criteria to ensure that the structure and component intended function(s) will be maintained under all CLB design conditions. Information from available references may be cited. It is not necessary to justify any acceptance criteria taken directly from the design basis information that is included in the UFSAR because that is a part of the

CLB. Also, it is not necessary to discuss CLB design loads if the acceptance criteria do not permit degradation because a structure and component without degradation should continue to function as originally designed. Acceptance criteria, which do permit degradation, are based on maintaining the intended function under all CLB design loads.

The staff reviewed the license renewal basis evaluation document, SNC-corporate and VEGP-specific implementation procedures and 10-Year ISI Plan for the VEGP units as part of its review of the ISI Program to determine how the "acceptance criteria" program element for the ISI Program compared with the staff's recommendations in SRP-LR Section A.1.2.3.6.

Based on its review of license renewal basis evaluation document for the ISI Program, the staff concludes that the applicant credits the applicable acceptance standards in the ASME Code Section XI, Articles IWA-3000, IWB-3000, IWC-3000, IWD-3000, or IWF-3000 as the applicable acceptance criteria for the ISI Program, and that the applicant performs additional evaluations in accordance with the analytical procedures in IWB-3600, IWC-3600, or IWD-3600, if the applicant determines that recordable flaw indications are greater than the applicable ASME Code Section XI acceptance standard limits.

The staff asked the applicant to clarify the ASME Code Section options that could be used for the evaluation of flaws that are in excess of the ASME Code Section XI acceptance standards. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the corrective actions taken in response to indications identified during ISI Program inspections are consistent with the requirements of 10 CFR 50.55a and ASME Section XI Articles IWA-3000, IWB-3000, IWC-3000, IWD-3000, and IWF-3000 and may include acceptance by supplemental examination, by analytical evaluation, or by repair / replacement. The applicant also stated that any unacceptable flaw indication or condition identified during ISI Program activities results in initiation of a condition report and subsequent evaluation of the condition by the corrective actions program. The applicant stated that the SNC Quality Assurance Program performs periodic audits of the ISI Program to ensure that the corrective actions are consistent with 10 CFR 50.55a and ASME Section XI requirements. The staff finds the applicant's response to this question to be acceptable because: (1) the applicant has stated that the applicant is using the appropriate flaw evaluation and corrective action criteria in the ASME Code Section XI to assess and, if necessary, correct flaw indications or conditions that are detected as part of the applicant's ASME Code Section XI ISI Program, and (2) the applicant has stated that it applies its 10 CFR Part 50, Appendix B, Quality Assurance Program to ensure that its ISI is being implemented in accordance with the requirements of 10 CFR 50.55a and the ASME Code Section XI. The staff's question on this matter is resolved.

Based on this review, the staff finds the "acceptance criteria" program element to be acceptable because the applicant has clarified that it uses the applicable acceptance criteria in the ASME Code Section XI as its basis for evaluating relevant flaw indications in ASME Code Class components, and because the ASME Code Section XI establishes NRC required acceptance criteria (as required in accordance with the requirements in 10 CFR 50.55a) for evaluating recordable flaw indications that are detected as part of the non-destructive testing examinations that are implemented in accordance with the AMP.

The staff finds that the “acceptance criteria” program element for ISI Program conforms to the “acceptance criteria” program element recommended in SRP-LR Section A.1.2.3.6 because the applicant has provided clarification to identify which acceptance criteria in the CLB, as defined by the applicable acceptance criteria of the ASME Code Section XI, are used as the acceptance criteria for the ISI Program, and because the applicant has clarified those corrective action options that are available for implementation if these acceptance criteria are exceeded.

(10) Operating Experience - LRA Section B.3.13 states that, because the ASME Code is a consensus document widely used over a long period, it has been generally effective in managing aging effects in Classes 1, 2, and 3 components and their attachments. The GALL Report includes some specific examples of industry operating experience with component degradation. The ISI Program is in accordance with general requirements for engineering programs. Periodic program reviews ensure compliance with regulatory, process, and procedural requirements. The applicant stated that review of recent ISI Program performance results show that the program has found and corrected degradation attributable to aging effects effectively. The ISI Program has detected leakage at mechanical connections and surface corrosion, minor conditions either corrected or found acceptable for continued service. Previously the program detected wall loss in the Unit 2 stainless steel chemical volume and control system letdown piping between the flow orifices and their isolation valves and determined the pipe thinning mechanism to be cavitation-induced erosion. Piping replacement and design modifications corrected the problem. The ISI Program monitors these locations for this effect.

SRP-LR Section A.1.2.3.10, “operating experience” provides the following recommendation for the “operating experience” program elements for preventative/mitigative-based, condition monitoring-based, and performance-monitoring-based AMPs:

> Operating experience with existing programs should be discussed. The operating experience of aging management programs, including past corrective actions resulting in program enhancements or additional programs, should be considered. A past failure would not necessarily invalidate an aging management program because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information can show where an existing program has succeeded and where it has failed (if at all) in intercepting aging degradation in a timely manner. This information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The staff reviewed the license renewal basis evaluation document and the operating experience document for the ISI Program to determine how the “acceptance criteria” program element for the ISI Program compared with the staff’s recommendations in SRP-LR Section A.1.2.3.10. The staff focused its review on operating experience related to generic operational experience related to augmented inspections of U.S. PWR upper reactor vessel closure head (RVCH) penetration nozzles and VEGP-specific experience with the augmented inspections that have been performed on the upper RVCH penetration nozzles for the VEGP units. The staff also focused on relevant VEGP-specific operating experience related to augmented inspections of the VEGP chemical and volume control systems (CVCS). In this manner, the staff focused its review on those generic and plant-specific operational experience that were determined to be risk-significant by the license and had resulted in the applicant's augmentation of its ISI program.

The staff concludes that the applicant has performed and will continue to perform augmented inservice inspections of the VEGP ASME Code Class 1 upper reactor vessel closure head (RVCH) penetration nozzles in accordance with the NRC's first revised order EA-03-009. The staff also determined that the augmented inspections include ultrasonic testing (UT) and eddy current testing (ET) of the penetration nozzles and their associated nickel alloy partial penetration J-groove welds, and bare metal visual (BMV) examinations of the adjacent low alloy steel base metal in the upper RVCH. The staff noted that recent augmented inspections of the upper RVCH penetration nozzles at VEGP Unit 1 in refueling outage (1R13) did not indicate any indication of cracking in the nickel alloy j-groove welds. The applicant implements these augmented ISI examinations as part of its "Nickel Alloy management program for reactor vessel closure head penetrations." The staff has evaluated the applicant's Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations and its evaluation is further evaluated and documented in Section 3.0.3.1.1 of this SER. Based on this assessment, the staff concludes that the applicant's ISI program includes an assessment of relevant generic operating experience events and a process and actions to augment its ISI Program based on this experience.

From its review of the operating experience document for this AMP, the staff also determined that the applicant currently implements augmented inspections of the chemical and volume control system (CVCS) let down piping between the flow orifices and their respective isolation valves in accordance in accordance with the VEGP risk-informed ISI (RI-ISI) program. The applicant indicated that VEGP-specific augmented UT examinations of this piping had indicated that wall thinning had occurred in this CVCS piping. The applicant indicated that it had performed a root cause analysis of thinning in this CVCS piping and that the root cause analysis attributed the wall loss to thinning by cavitation. The applicant stated that the root cause analysis eliminated flow-accelerated corrosion (FAC) as the relevant wall thinning mechanism as the component piping is fabricated from stainless steel, which is not susceptible to FAC-induced erosion.

As part of its review of the LRA, the staff noted that the applicant's Flow-Accelerated Corrosion Program (LRA AMP B.3.10) is also credited to manage both loss of material resulting from flow-accelerated corrosion and loss of material by cavitation.

The staff asked the applicant to clarify whether the augmented inspections of the CVCS piping for loss of material by cavitation would be implemented as part of the applicant's augmented UT inspection activities under is ISI Program or as part of the applicant's UT inspection activities that are implemented under its Flow-Accelerated Corrosion Program.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the augmented UT inspection activities for the CVCS piping would be implemented as part of the applicant's augmented inspection activities for the ISI Program. The staff's finds the applicant's response to be acceptable because the response clarifies that the augmented UT inspections of the CVCS piping will be implemented as part of the applicant's augmented inspection activities that are within the scope of the ISI Program. The staff's question is resolved. Based on this assessment, the staff concludes that the applicant's ISI program includes an assessment of relevant VEGP-specific operating experience events and a process and actions to augment its ISI Program based on this experience.

Based on this evaluation, the staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10 and that the program incorporates relevant generic and VEGP-specific operating experience. Based on this review, the staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.13, 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 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.5 Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations

Summary of Technical Information in the Application: LRA Section B.3.14 describes the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations as a plant-specific program.

The applicant stated that the plant-specific Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations manage cracking due to primary water stress corrosion cracking (PWSCC) for non-reactor vessel head nickel alloy component locations. The overall goal of the program is to maintain plant safety and minimize the impact of PWSCC on plant availability through assessment, inspection, mitigation, and repair or replacement of susceptible components. Program development is based on MRP-126, "Generic Guidance for Alloy 600 Management." MRP-126 is not intended to address

Alloy 600 in steam generator tubing; the industry has a separate program for this issue, EPRI's Steam Generator Management Program, which the applicant discusses in Appendix B.3.26 of the LRA.

The applicant also stated that the non-reactor vessel closure head penetration locations in PWR reactor coolant systems, PWSCC of Alloy 600 base material and Alloy 82 / 182 weld materials is a currently emerging materials degradation issue. The VEGP Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations is being developed to address concerns regarding the potential for PWSCC in nickel alloy components exposed to a high temperature reactor coolant environment. While elements of this program exist, implementation details are still under development by the industry. Consequently, this program has been categorized as a new program for license renewal.

The applicant further stated that the program is based on the following set of implementation commitments:

1) SNC will continue to participate in industry initiatives directed at resolving PWSCC issues, such as owners group programs and the EPRI Materials Reliability Program.

2) SNC will comply with applicable NRC Orders.

3) SNC will submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. The program implementation commitments are consistent with the aging management program commitments listed in NUREG-1801, Rev. 1, Vol. 2, Section IV for managing PWSCC for non-reactor vessel head nickel alloy components.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.14 on the applicant’s demonstration of the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations 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 Generic Aging Lessons Learned (GALL) report, NUREG-1801, Vol. 2, Rev. 1, 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 extended period of 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 structures or components for license renewal without change. The GALL report also contains recommendations on specific areas for which existing programs should be augmented for license renewal.

Guidance for the aging management of nickel-alloy material components is provided in the aging management review line items of Chapter IV, “Reactor Vessel, Internals, and Reactor Coolant System,” in the GALL report. The items applicable to nickel-alloy material components in Westinghouse reactors are found within sections A2, “Reactor Vessel (Pressurized Water Reactor),” B2 “Reactor Vessel Internals (PWR) – Westinghouse,” C2, “Reactor Coolant System and Connected Lines (Pressurized Water Reactor)”, and D1, “Steam Generator (Recirculating).”

The aging management programs specified in the GALL report for nickel-alloy non-reactor vessel closure head penetration locations consist of the following:

1) Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” for Class 1 components

2) Chapter XI.M2, “Water Chemistry,” for PWR primary water

3) Fatigue is a time-limited aging analysis (TLAA) to be performed for the period of extended operation, and, for Class 1 components, environmental effects on fatigue are to be addressed. See the Standard Review Plan, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).

4) Commit in the FSAR supplement to (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) 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, submit an inspection plan for reactor internals to the NRC for review and approval.

5) Comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.

The ASME Section XI Inservice Inspection program is addressed in Appendix B.3.13 of the LRA and Final Safety Analysis Report (FSAR) supplement Appendix A.2.13. The Water Chemistry program is addressed in Appendix B.3.28 of the LRA and FSAR supplement Appendix A.2.28. The fatigue TLAA is addressed in section 4.3, “Metal Fatigue,” of the LRA and FSAR supplement Appendix A.3.2. FSAR supplement A.2.14, “Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations” contains commitments that 1) SNC will continue to participate in industry initiatives directed at resolving PWSCC issues, such as owners group programs and the EPRI Materials Reliability Program, 2) SNC will comply with applicable NRC Orders, and 3) SNC will submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. In addition, FSAR supplement Appendix A.2.24, “Reactor Vessel Internals Program,” contains a commitment to submit an inspection plan for the VEGP reactor vessel internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2.

The applicant indicates that currently, management of PWSCC in nickel alloys is a rapidly evolving area and as a result, program attributes have not yet been finalized. Further, where industry guidance has been developed, there are ongoing efforts to reach acceptable resolution of NRC staff concerns which may alter program requirements. Therefore, the applicant has not included assessments for each of the ten aging management program elements for this program. The applicant has committed (Commitment No. 12) to revise the program to insure compliance with NRC regulations and submit an inspection plan prior to the period of extended operation.

The staff reviewed the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations against the AMP elements found in the GALL Report based on the applicant's submittal. However, on submittal to the NRC of the licensee's inspection plan, a further review of the following sections in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1, should be performed:

- 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
- Operating experience

(1) Scope of the Program - LRA Section B.3.14 states that the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations will manage cracking due to PWSCC for the following nickel alloy component locations:

- Butt welds within the primary system including:

  - Reactor Vessel Inlet and Outlet Nozzle Dissimilar Metal Welds

  - Pressurizer Surge, Spray, Safety, and Relief Nozzle Dissimilar Metal Welds

- Reactor Vessel Bottom Mounted Instrument Nozzles

- Reactor Vessel Flange Leakage Monitor Tube

- Steam Generator Primary Channel Head Drain Connection Tube & Dissimilar Metal Welds

The staff noted that nickel alloy materials are managed under several other programs such as the Reactor Vessel Internals Program, the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations, the Steam Generator Tube Inspection Program, and the Steam Generator Program for Upper

Internals. Components addressed in these programs are, appropriately, not included in the program scope of the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations.

The staff confirmed that the “scope of the program” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - A description of this program element was not included in LRA Section B.3.14. However, the applicant noted use of the ASME Code Section XI inspection requirements for ISI and committed to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance.

The staff finds that the preventive actions usable under the Nickel Alloy Inspection Program are inspection and mitigation. Inspection uses nondestructive and visual examination methods to monitor the aging of the nickel alloy components as required by the ISI program and as augmented by the recommendations of applicable bulletins, generic letters and NRC approved industry guidance. In this manner, it is a condition or performance monitoring program and in accordance with SRP LR Section A.1.2.3.2 no additional review is required. Some mitigation techniques are currently available for use to address nickel alloy components, however numerous more options are being explored to address the mitigation of active degradation mechanisms for these components as noted in Commitment No. 12.

The staff notes the applicant committed to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. Also, in a letter dated June 27, 2007, the applicant provided Commitment No.12 to implement the Program prior to the period of extended operation. 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).

These programs will address the available authorized mitigation techniques and their application. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. The staff will review the inspection plan under the “preventive actions” program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.2.

Based on this review and the applicant’s commitments, the staff confirms that the “preventive actions” program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected – LRA Section B.3.14 the Nickel Alloy Inspection Program detects degradation by using the examination and inspection requirements of ASME Section XI, augmented as appropriate by examinations in response to NRC Orders, Bulletins and Generic Letters, or to accepted industry guidelines. The parameters monitored are the presence and extent of cracking.”

For condition monitoring programs, SRP-LR Section A.1.2.3.3 states:

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s)," and "[f]or a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. Some examples are measurements of wall thickness and detection and sizing of cracks.

The staff notes that the Nickel Alloy Inspection Program uses the appropriate volumetric, surface and visual NDE techniques for detection of degradation of the components identified in the scope of the program as required by ASME Code and recommended by the applicable bulletins, generic letters and industry guidance.

The applicant committed (Commitment No. 12) to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. The staff will review the "parameters monitored or inspected" program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.3 during the review of the program inspection plan.

Based on this review and the applicant's commitments, the staff confirms that the "parameters monitored or inspected" program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - A description of this program element was not included in LRA Section B.3.14. However, the applicant noted use of the ASME Code Section XI inspection requirements for ISI and committed to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance.

The NRC has approved, in accordance with 10 CFR 50.55a, the specific techniques and frequencies for monitoring nickel alloy components are prescribed by ASME Code Section XI for those components examined in accordance with the ISI program. For other items included in the scope of the Nickel Alloy Inspection program, the methods and frequencies of examination are recommended in the applicable bulletins, generic letters and industry guidance. Each of these programs for the detection of aging effects would have been written by or analyzed by the NRC to provide adequate detection capability. The applicant has a commitment (Commitment No. 12) to submit an inspection plan detailing these programs to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. The staff will review the "detection of aging effects" program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.4 during the review of the program inspection plan.

Based on this review and the applicant's commitments, the staff confirms that the applicant's commitment in the "detection of aging effects" program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - A description of this program element was not included in LRA Section B.3.14. However, the applicant noted use of the ASME Code Section XI inspection requirements for ISI and committed to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance.

In general, the tools for monitoring and trending of nickel alloy component inspection programs are based on the scope and reporting requirements established by the ASME Code as required by 10 CFR 50.55a. The staff notes that ASME Section XI requires, “recording of examination and test results that provide a basis for evaluation and facilitate comparison with the results of subsequent examinations.” ASME Section XI also requires, “retention of all inspection, examination, test, and repair /replacement activity records and flaw evaluation calculations for the service lifetime of the component or system.” ASME Section XI additionally provides rules for “additional examinations” (i.e., sample expansion), when flaws or relevant conditions are found that exceed the applicable acceptance criteria, to assist in determination of an extent of condition and causal analysis.

Specific monitoring or trending requirements may be created under NRC Bulletins, Generic Letters and staff accepted industry guidance. As these programs change due to the evolving development of long term inspection requirements in this area, the review for monitoring and trending of these programs is based on the commitment (Commitment No. 12) of the applicant to provide an inspection plan to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. The staff will review the “monitoring and trending” program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.5 during the review of the program inspection plan.

Based on this review and the applicant’s commitments, the staff confirms that the “monitoring and trending” program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - A description of this program element was not included in LRA Section B.3.14. However, the applicant noted use of the ASME Code Section XI inspection requirements for ISI and committed (Commitment No. 12) to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

In general, the acceptance criteria of nickel alloy component inspection programs are based on the scope and reporting requirements established by the ASME Code as required by 10 CFR 50.55a. The staff notes that ASME Section XI, IWB-3000 contains acceptance criteria appropriate for the reactor coolant pressure boundary components examined in accordance with Section XI. Also, ASME Section XI, IWA-5250 was verified to contain acceptable steps for evaluation and corrective measures for sources of leakage identified by visual examinations for leakage. These requirements ensure that nickel alloy components in the reactor coolant pressure boundary maintain their designed function under all required design conditions.

Specific acceptance criteria may be created under NRC Bulletins, Generic Letters and staff accepted industry guidance. As these programs change due to the evolving development of long term inspection requirements in this area, the acceptance criteria review of these programs is based on the commitment (Commitment No. 12) of the applicant to provide an inspection plan to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

The staff will review the “acceptance criteria” program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.6 during the review of the program inspection plan.

Based on this review and the applicant’s commitments, the staff confirms that the “acceptance criteria” program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(7) Corrective Actions - A description of this program element was not included in LRA Section B.3.14. However, the applicant noted use of the ASME Code Section XI inspection requirements for ISI and committed (Commitment No. 12) to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

The staff will review the “corrective actions” program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.7 during the review of the program inspection plan.

Based on this review and the applicant’s commitments, the staff confirms that the “corrective actions” program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.7. The staff finds this program element acceptable.

(8) Confirmation Process - A description of this program element was not included in LRA Section B.3.14. However, the applicant committed (Commitment No. 12) to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

The staff will review the “confirmation process” program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.8 during the review of the program inspection plan.

Based on this review and the applicant's commitments, the staff confirms that the "confirmation process" program element satisfies the recommendations in the GALL Report and the guidance in SRP-LR Section A.1.2.3.8. The staff finds this program element acceptable.

(9) Administrative Controls - A description of this program element was not included in LRA Section B.3.14. However, the applicant committed (Commitment No. 12) to submit a program inspection plan for VEGP that includes implementation of applicable NRC Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

The staff will review the "administrative controls" program element criterion as defined in the GALL Report and in SRP-LR Section A.1.2.3.9 during the review of the program inspection plan.

(10) Operating Experience - LRA Section B.3.14 states that within the industry, Alloy 600/82/182 locations experiencing PWSCC include vessel head CRDM penetrations, bottom mounted instrument penetrations, butt weld locations, steam generator drain connections, and pressurizer penetrations. The most recent industry experience relates to detection of indications in pressurizer nozzle butt welds at a number of PWRs. At VEGP, PWSCC has not been detected at any Alloy 600/82/182 location to date. However, there is no reason to conclude that VEGP Alloy 600/82/182 locations will not experience PWSCC based on similarities with other units where PWSCC has been detected. Recent inspection history for VEGP Units 1 and 2 is summarized below.

VEGP Pressurizer Butt Welds

For the VEGP Unit 1 pressurizer butt weld locations, only the spray nozzle Alloy 82 butt weld has been volumetrically examined with a performance demonstration initiative qualified ultrasonic inspection technique. This examination was performed during the Spring 2005 refueling outage, with no recordable indications identified. Bare metal visual examinations have been performed on all Unit 1 Alloy 82 butt welds during both the Spring 2005 and Fall 2006 refueling outages, with acceptable results. Mitigation of the Unit 1 Alloy 82 butt welds by application of full structural weld overlays using Alloy 52/152 materials was performed during the Spring 2008 refueling outage. Due to geometric limitations on inspection coverage and heightened concerns regarding the potential for PWSCC at pressurizer nozzle butt weld locations, all VEGP Unit 2 pressurizer butt weld locations were mitigated in the Spring 2007 refueling outage by application of full structural weld overlays using Alloy 52/152 weld material. Due to the structural replacement of the original Alloy 82/182 welds, prior inspection results are no longer meaningful.

VEGP Reactor Vessel Nozzle Butt Welds

During the Fall 2006 refueling outage for Unit 1 and the Spring 2007 refueling outage for Unit 2, all eight reactor vessel nozzle butt welds were volumetrically examined using a performance demonstration initiative qualified ultrasonic inspection technique, with no recordable indications identified. Additionally, bare metal visual examination did not identify any indication of leakage.

Reactor Vessel Bottom Mounted Instrumentation Penetrations

Bare metal visual examination of the bottom head area was performed for Unit 1 during the Fall 2006 refueling outage and for Unit 2 during the Spring 2007 refueling outage with no indications of leakage identified. As a supplemental measure VEGP conducted volumetric examinations of Unit 1 and Unit 2 bottom mounted instrument penetrations during the Fall 2006 Unit 1 refueling outage and the Spring 2007 Unit 2 refueling outage. The inspection used ultrasonic and eddy current methods capable of detecting cracking of base material. Fifty-seven of fifty-eight Unit 1 penetrations were successfully examined and forty-six of fifty-eight Unit 2 penetrations were successfully examined. There were no recordable indications identified for any bottom mounted instrument penetration.

Steam Generator Primary Channel Head Drain Connection Tube & Dissimilar Metal Weld

For the steam generator primary channel head drains, a select number of plants having a design similar to that used in the VEGP Model F steam generators have experienced leaks due to PWSCC. The leaks were detected through visual identification of boric acid crystals around the drain line coupling. Detailed analysis indicated that the cracks initiated at the backside of the partial penetration weld, which is exposed to reactor coolant. To date, bare metal visual and VT-2 examination of the VEGP drain locations has not identified any cracking. Bare metal visual examination and VT-2 examination will be performed at each refueling outage until the location is mitigated.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Sections A.2.14, the applicant provided the UFSAR supplement for the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations. 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).

<u>Conclusion</u> The staff has reviewed LRA Appendix section B.3.14, which describes the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations as a plant-specific program and finds that the program in conjunction with the commitments made by the applicant meet the guidance as established in the GALL report, NUREG-1801, Vol. 2, Rev. 1, for structures and/or components made of nickel alloy material.

On the basis of its technical review of the applicant’s Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations and applicant’s Commitment No. 12, the staff concludes that the applicant has demonstrated that 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.6 Periodic Surveillance and Preventive Maintenance Activities

Summary of Technical Information in the Application LRA Section B.3.21 describes the existing Periodic Surveillance and Preventive Maintenance Activities as a plant-specific program.

The applicant stated that the Periodic Surveillance and Preventive Maintenance Activities includes existing and new periodic inspections and tests relied on for license renewal to manage aging effects for the components included in the program. Implementation of the Periodic Surveillance and Preventive Maintenance Activities is generally through repetitive tasks and surveillances. The program activities credited for license renewal are described under the heading "Detection of Aging Effects." Enhancements to the Periodic Surveillance and Preventive Maintenance Activities 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.3.21 on the applicant's demonstration of the Periodic Surveillance and Preventive Maintenance Activities 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 Activities against the staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Periodic Surveillance and Preventive Maintenance Activities would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program – The "scope of the program" program element criterion in SRP-LR Section A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

    The applicant states in LRA Section B.3.21 that the Periodic Surveillance and Preventive Maintenance Activities for license renewal are credited with managing the aging effects described in the AMRs. These activities are described under the heading "Detection of Aging Effects."

During the audit and review, the staff reviewed the applicant's program basis document for this program and noted that it contains a list of specific components within the scope of this program. The list identifies that those preventive maintenance (PM) and surveillance testing activities credited with managing aging effects apply to:

- Control Building Control Room Filter Unit seals
- Emergency Diesel Generator Diesel Fuel Oil Storage Tanks (interior surfaces)
- Steam Generator Blowdown Trim Heat Exchangers' shells (interior Surfaces)
- Secondary Steam Generator Blowdown Sample Baths' shells (interior surfaces)
- Steam Generator Blowdown Corrosion Product Monitor coolers' shells and heads (interior surfaces)
- Nuclear Service Cooling Water Cooling Tower Fill and Drift Eliminators
- Potable Water System water heater housings (A2417S4001E01 and E02 only)
- Boric Acid Storage Tank (BAST) diaphragms
- Condensate Storage Tank (CST) diaphragms
- Reactor Make-up Water Storage Tank (RMWST) diaphragms

The staff also noted that the Periodic Surveillance and Preventive Maintenance Activities will be enhanced by the addition of PM activities to manage the secondary steam generator blowdown sample baths' shells, steam generator blowdown corrosion product monitor cooler's shells and heads, and the within scope potable water system water heater housings. The staff reviewed the surveillance and PM activities that will be performed and found that it contains acceptance criteria which will be used to determine if the component's condition is acceptable. Further, the staff noted that the surveillance and PM activities and enhancements will include periodic visual inspections of interior surfaces and that these inspections are performed as part of routine surveillances tests or maintenance. The staff finds the use of the Periodic Surveillance and Preventive Maintenance Activities acceptable since it includes activities to manage the aging effects being addressed.

The staff concludes that the specific components for which the program manages aging effects are identified, which satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds the applicant's scope of the program acceptable.

(2) Preventive Actions – The “preventive actions” program element criterion in SRP-LR Section A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

> The applicant states in LRA Section B.3.21 that the Periodic Surveillance and Preventive Maintenance Activities is a condition monitoring program. The inspections and testing activities detect but do not prevent aging effects; however, the activities prevent component failures that might be caused by aging effects.

During the audit and review, the staff reviewed the applicant’s program basis document for this program which identifies it as a condition monitoring program and that its inspection and testing activities used to identify component aging effects do not prevent aging effects. The program document also stated that the periodic surveillance and PM activities perform condition monitoring and is therefore consistent with the SRP-LR. The staff concludes that these activities will provide for the timely detection of aging degradation and are acceptable.

The staff confirmed that the “preventive actions” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected – The “parameters monitored or inspected” program element criterion in SRP-LR Section A.1.2.3.3 are:

> The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameters monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.3.21 that for each inspection or test activity instructions on the parameters monitored or inspected permit early detection of degradation prior to loss of component intended function. Parameters monitored or inspected vary with the component(s) and aging effects managed. Inspection and testing activities monitor various parameters (e.g., surface condition, loss of material, presence of corrosion products or fluid leakage, signs of cracking, or reduction of wall thickness).

During the audit and review, the staff reviewed the applicant’s program basis document for this program which identified the types of parameters monitored in order to permit early detection of degradation prior to loss of component intended function. Specifically, the parameters monitored or inspected, which are based on the components(s) and the aging effect(s) being managed, include surface condition, loss of material, presence of corrosion products or fluid leakage, signs of cracking, or reduction of wall thickness. The staff finds that the parameters monitored will provide effective indications of aging degradation for the aging effects being addressed and are acceptable.

This program element satisfies the criteria defined in SRP-LR Section A.1.2.3.3. The staff finds it acceptable on the basis that the applicant specifically identifies each component within the scope of the program, provides a description of the aging management activity along with the aging effect(s) being managed, and the related plant implementing procedure.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects – The "detection of aging effects" program element criteria in SRP-LR Section A.1.2.3.4 are:

> Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. Provide information that links the parameters to be monitored or inspected to the aging effects being managed. Describe "when," "where," and "how" program data are collected.
>
> The method or technique and frequency may be linked to plant-specific or industry-wide operating experience. Provide justification, including codes and standards referenced, that the technique and frequency are adequate to detect the aging effects before a loss of SC intended function. A program based solely on detecting SC failures is not considered an effective aging management program.
>
> When sampling is used to inspect a group of SCs, provide the basis for the inspection population and sample size. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects. The sample size should be based on such aspects of the SCs as the specific aging effect, location, existing technical information, system and structure design, materials of construction, service environment, or previous failure history. The samples should be biased toward locations most susceptible to the specific aging effect of concern in the period of extended operation. Provisions should also be included on expanding the sample size when degradation is detected in the initial sample.

The applicant states in LRA Section B.3.21 that the Periodic Surveillance and Preventive Maintenance Activities periodically inspect and test components to detect aging effects. Established inspection and testing intervals for timely detection of degradation vary with the component, material, and environment, and consider industry and plant-specific operating experience and manufacturer recommendations. The extent and schedule of inspections and testing assure detection of component degradation prior to loss of intended functions. The program uses established techniques like visual inspections.

The applicant stated that a visual inspection of the control building control room filter unit seals is part of the control room emergency filtration system filter testing required by the VEGP Technical Specifications. Cleaning and inspection of the EDG diesel fuel oil storage tanks are preventive maintenance tasks. Visual inspection of the tanks detects degradation of the applied inorganic zinc coating or the underlying base material. VEGP Technical Specifications require these cleaning and visual inspection tasks every ten years. Note: The One-Time Inspection Program will measure wall thickness of the EDG diesel fuel oil storage tank bottoms. Visual inspection of the SG blowdown trim heat exchanger is a preventive maintenance task. Inspection by visual or other nondestructive examination technique of the secondary steam generator blowdown sample bath and the SG blowdown corrosion product monitor cooler are new preventive maintenance tasks that manage loss of material from the interior of these heat exchanger shells.

These heat exchangers are cooled by well or river water but not by NSCW; therefore, they are not in the scope of the GL 89-13 Program.

The applicant further stated that visual inspection of the NSCW cooling towers is a preventive maintenance task that collects sample specimens of the tower fill and drift eliminators. Failure load testing of the specimens evaluates deterioration of the tower fill and drift eliminators. Visual inspection of the potable water system water heater housings within the scope of license renewal is a new preventive maintenance task that will manage loss of material by inspecting for evidence of leakage and loss of material on the housing. Visual inspections of the boric acid storage tank, condensate storage tank, and reactor make-up water storage tank diaphragms are preventive maintenance tasks that manage change in material properties (including cracking) and loss of material on the internal elastomer diaphragms in these tanks.

During the audit and review, the staff reviewed the applicant’s program basis document for this program which identified the detection of aging effects activities. These address each type of inspection appropriate to the components’ intended functions in order that they will be adequately maintained for the period of extended operation. The staff noted that the applicant’s program includes a list and description of each component and the corresponding activities associated with this AMP and their plant-specific task identifiers.

In Enclosure 2 of letter dated, June 27, 2007 the applicant made a commitment (Commitment No. 18) to enhance the Periodic Surveillance and Preventive Maintenance Activities by preparing the plant-specific task identifiers and procedures, for the secondary steam generator blowdown sample baths’ shells, steam generator blowdown corrosion product monitor coolers’ shells and heads, and the potable water system water heater housings. The staff finds that the activities for the detection of aging effects are identified and are acceptable.

The staff concludes that this program element satisfies the criteria defined in SRP-LR Section A.1.2.3.4. The staff finds it acceptable on the basis that the applicant specifically identifies each component within the scope of the program, provides a description of the aging management activity along with the aging effect(s) being managed, and the related plant implementing procedure. Further, the applicant identifies the frequency that the periodic surveillance and preventive maintenance activity will be performed.

The staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending – The "monitoring and trending" program element criteria in SRP-LR Section A.1.2.3.5 are:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.
>
> This program element should describe "how" the data collected are evaluated and may also include trending for a forward look. This includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function. The parameter or indicator trended should be described. The methodology for analyzing the inspection or test results against the acceptance criteria should be described.

The applicant states in LRA Section B.3.21 that preventive maintenance and surveillance testing activities monitor and trend age-related degradation. Inspection and testing intervals for timely detection of component degradation vary with the component, material, and environment and consider industry and plant-specific operating experience and manufacturer recommendations. The frequency of inspection or other activities is subject to change for plant-specific environments or observed degradation. Such observations may dictate that an increased or decreased task frequency would be appropriate for a particular activity.

During the audit and review, the staff reviewed the applicant's program basis document for this program which includes a list and description of each component and their corresponding activities associated with this AMP, and their plant-specific task identifiers. The staff noted that for each inspection or testing activity described, the results are compared to acceptance criteria appropriate for that component and inspection or test, as provided in the identified procedures. Additionally, the staff noted that for the NSCW cooling tower fill and drift eliminators, the failure load values are plotted and trended to estimate the remaining life of these components. Further, the staff noted that although for those inspection and testing activities which are visual inspections that do not record quantitative data and therefore no prediction is made for rate of degradation, failures to meet the acceptance criteria are trended by the corrective action process.

The staff finds that the monitoring and trending activities included will provide timely detection of aging degradation for the aging effects being addressed and are acceptable.

The staff concludes that this program element satisfies the criteria defined in the SRP-LR Section A.1.2.3.5 on the basis that the program describes each inspection or testing activity and that their acceptance criteria would identify age related degradation in a timely manner.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria – The "acceptance criteria" program element criteria in SRP-LR Section A.1.2.3.6 are:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The applicant states in LRA Section B.3.21 that acceptance criteria for the Periodic Surveillance and Preventive Maintenance Activities will be defined in specific inspection and testing procedures. The acceptance criteria confirm component integrity by verifying the absence of aging effect(s) or by comparing parameters to limits based on intended function(s) established by the plant design basis. Acceptance criteria correlating directly to the AERMs will be based on codes, standards, specifications, vendor recommendations, industry guidance, engineering judgment, and plant-specific operating experience. Unacceptable degradations will have condition reports resolved under the corrective action process.

During the audit and review, the staff reviewed the applicant's program basis document for this program which identified the acceptance criteria for each type of inspection appropriate to the component's AERM. The staff noted that the applicant's program includes a list and description of each component and their corresponding activities associated with this AMP and their plant-specific task identifiers. Further the documents state that acceptance criteria are provided within each procedure associated with the plant-specific task.

In Enclosure 2 of letter dated, June 27, 2007 the applicant made a commitment (Commitment No. 18) to enhance the Periodic Surveillance and Preventive Maintenance Activities by preparing the plant-specific task identifiers and procedures which include their acceptance criteria, for the secondary steam generator blowdown sample baths' shells, steam generator blowdown corrosion product monitor coolers' shells and heads, and the potable water system water heater housings. The staff finds the acceptance criteria appropriate for the aging effects being addressed.

The staff concludes that this program element satisfies the criteria in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable on the basis that the acceptance criteria are provided within each procedure associated with the plant-specific task. Further, all conditions not meeting the acceptance criteria are reported and documented in the VEGP corrective action process.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience – The “operating experience” program element criterion in SRP-LR Section A.1.2.3.10 is:

> The operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states in LRA Section B.3.21 that periodic visual inspections have detected degradation of the filter unit door seals, indicating that the program to monitor these seals is effective. As noted in the report of Diesel Fuel Oil Program operating experience, recent 10-year cleaning and visual inspection of the EDG fuel oil storage tanks detected no degradation of the inorganic zinc coating or tank base metal. Periodic inspections of the SG blowdown trim heat exchangers for fouling, corrosion, and other adverse conditions have detected fouling of the heat exchangers but not corrosion. With no current repetitive tasks, no inspection history is available for the secondary SG blowdown sample baths or the SG blowdown corrosion product monitor coolers. The applicant also stated that the maintenance history of these heat exchangers shows no corrosion. These heat exchangers are only within the 10 CFR 54.4(a)(2) scope of license renewal for pressure boundary concerns so the shell needs management for loss of material only. Reduction of heat transfer is not an AERM for these heat exchangers. In failure load testing of the tower fill and drift eliminators since 1988 through the latest report in 2003, no specimens have failed to meet the acceptance criteria, and the projected lifetime of the tower fill and drift eliminators indicates that the material deteriorates slowly in the tower environment. The potable water system water heater housings currently have no scheduled inspection repetitive tasks, so no history for planned tasks is available. The maintenance history of these heat exchangers shows no leakage due to corrosion. The applicant further stated that the original boric acid storage tank, condensate storage tank, and reactor make-up water storage tank diaphragms have been replaced with diaphragms constructed of an improved elastomer material. Since these replacements, periodic bladder inspections have detected several instances of tears in the diaphragms. The diaphragm vendor attributed the tears to improper operation, not aging, as the tanks were not maintained with a nitrogen blanket between the diaphragm and the water. Without nitrogen blankets the diaphragms can “stick” to the tank wall, creating sufficient force to tear them during level changes. Procedures are in place to correct the operational deficiency with no aging-related failures observed since the diaphragms were replaced.

During the audit and review, the staff reviewed the operating experience in the LRA and the operating experience evaluation reports and also interviewed the applicant's technical personnel and confirmed that did not reveal any degradation not bounded by industry experience. The staff concludes that these operating experience events provide objective evidence that the Periodic Surveillance and Preventive Maintenance Activities will provide timely detection of aging degradation and corrective action.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Periodic Surveillance and Preventive Maintenance Activities will adequately manage the aging effects identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u> In LRA Section A.2.21, the applicant provided the UFSAR supplement for the Periodic Surveillance and Preventive Maintenance Activities. The staff reviewed the applicant's license renewal commitment letter (NL-07-1261, dated June 27, 2007) and confirmed that this program is identified as Commitment No. 18 to be implemented before the period of extended operation. 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).

<u>Conclusion</u> On the basis of its technical review of the applicant's Periodic Surveillance and Preventive Maintenance Activities, the staff concludes that the applicant has demonstrated that 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, upon implementation of Commitment No. 18, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.7 Reactor Vessel Internals Program

<u>Summary of Technical Information in the Application</u> LRA Section B.3.24 describes the new Reactor Vessel Internals Program as a plant-specific program.

The applicant stated that the Reactor Vessel Internals Program manages material degradation for the reactor vessel internals. The program will be based on the following set of implementation commitments:

- The applicant will participate in the industry program for investigating and managing aging effects on reactor vessel internals.

- The applicant will evaluate and implement the results of industry programs like the EPRI Materials Reliability Project (MRP) as applicable to the VEGP reactor vessel internals.

- The applicant will submit a reactor vessel internals inspection plan to the staff for review and approval at least 24 months before the period of extended operation for Units 1 and 2.

The applicant also stated that the Reactor Vessel Internals Program will be implemented prior to the period of extended operation. As program attributes are not yet fully developed, assessments for each of the ten aging management program elements are not included; assessments for each of the ten elements will be included in the inspection plan submitted for review and approval. The program implementation commitments are consistent with the AMP commitments listed in GALL Report Section IV.B2 for managing PWR reactor vessel internals. The scope of components to be included in the program includes all of the components and aging effects described in GALL Report Revision 1, Section IV.B2, with the following differences:

(1) The Reactor Vessel Internals Program will manage wear of reactor vessel internals components. Section IV.B2 credits Inservice Inspection Program visual inspections to manage such wear. Reactor vessel internals inspection and evaluation guidance currently in development by the EPRI MRP Reactor Internals Focus Group will consider potential wear of reactor vessel internals components. The ensuing inspection requirements may not align with those of ASME Code Section XI.

(2) The Reactor Vessel Internals Program will manage embrittlement of the bottom-mounted instrumentation column cruciforms, the only CASS reactor vessel internals components. These cruciforms are ASME SA-351 Grade CF8 castings. GALL Report Section IV.B2 credits the program described in GALL Report Section XI.M13, “Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS),” to manage embrittlement of cast austenitic stainless steel reactor vessel internals due to thermal aging and irradiation embrittlement.

    Reactor vessel internals inspection and evaluation guidance currently in development by the EPRI Reactor Internals Focus Group will consider the potential embrittlement of CASS reactor vessel internals. The applicant will apply the inspection and evaluation requirements from this industry effort to the bottom-mounted instrumentation column cruciforms in the Reactor Vessel Internals Program.

(3) The Reactor Vessel Internals Program will manage cracking of the reactor vessel core support lugs, pads, and their attachment welds. GALL Report Section IV.A2 does not credit the Reactor Vessel Internals Program for this component and aging effect combination.

(4) The Reactor Vessel Internals Program will manage wear of the reactor vessel closure head thermal sleeves. GALL Report Sections IV.A2 and IV.B2 do not address reactor vessel head thermal sleeves.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.24, Reactor Vessel Internals Program, and the applicant’s license renewal (LR) basis evaluation document for this AMP 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 Reactor Vessel Internals Program against the staff’s recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR

Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Reactor Vessel Internals Program would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed seven (7) of the applicant's program elements of a total of 10 against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program - LRA Section B.3.24 states that the scope of components to be included in the program includes all of the components and aging effects described in NUREG-1801, Rev. 1, Section IV.B2, with the following differences:

- "The VEGP Reactor Vessel Internals Program will manage wear of reactor vessel internals components. NUREG-1801, Section IV.B2, credits Inservice Inspection Program visual inspections to manage wear of the reactor vessel internals. Reactor vessel internals inspection and evaluation guidance currently in development by the EPRI MRP Reactor Internals Focus Group (MRP) will consider the potential for wear of reactor vessel internals components. The resulting inspection requirements may or may not align with existing ASME Section XI inspection requirements."
- "The VEGP Reactor Vessel Internals Program will manage embrittlement of the VEGP Bottom Mounted Instrumentation Column Cruciforms, which are the only VEGP cast austenitic stainless steel (CASS) reactor vessel internals components. These Cruciforms are ASME SA-351 Grade CF8 castings. NUREG-1801, Section IV.B2,credits the program described in NUREG-1801, Section XI.M13, "Thermal Aging and Neutron Embrittlement of Cast Austenitic Stainless Steel (CASS)" to manage embrittlement of cast austenitic stainless steel reactor vessel internals due to thermal aging and irradiation embrittlement."
- "Reactor vessel internals inspection and evaluation guidance currently in development by the MRP will consider the potential embrittlement of cast austenitic stainless steel reactor vessel internals. SNC will include the inspection and evaluation requirements resulting from this industry effort, applicable to the VEGP Bottom Mounted Instrumentation Column Cruciforms, in the Reactor Vessel Internals Program."

- “The Reactor Vessel Internals Program will manage cracking of the reactor vessel core support lugs, pads, and associated attachment welds. NUREG-1801, Section IV.A2, does not credit the Reactor Vessel Internals Program for this component and aging effect combination.”
- “The Reactor Vessel Internals Program will manage wear of the reactor vessel closure head thermal sleeves. NUREG-1801, Sections IV.A2 and IV.B2, do not address reactor vessel head thermal sleeves.”

SRP-LR Section A.1.2.3.1, “scope of program,” provides the following recommendation for AMP “scope of program” program elements:

> The specific program necessary for license renewal should be identified. The scope of the program should include the specific structures and components of which the program manages the aging.

The GALL Report, as invoked by the SRP-LR, does not currently include a recommended AMP for PWR reactor vessel internal components because the industry is currently in progress of developing its augmented inspection program for PWR RV internals and submitting this program to the NRC for review and approval. Instead, the AMR items in the GALL Report which invoke augmented inspection activities for PWR RV internals call for the applicants to provide the following commitment in the UFSAR supplements for their applications:

- participate in the industry programs for investigating and managing aging effects on reactor internals; (2) 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, submit an inspection plan for reactor internals to the NRC for review and approval.

The MRP, in conjunction with the Electric Power Research Institute (EPRI) and the Nuclear Energy Institute (NEI), are currently responsible for developing a set of industry-wide augmented inspection and flaw evaluation program guidelines for PWR RV internals and for getting these guidelines reviewed and approved by the NRC, with the intent to develop a consistent concerted set of augmented recommended guidelines that would be acceptable to both the industry and the NRC. Thus, the GALL report was updated in September 2005 to encourage PWR applicants to commit to the EPRI MRP Reactor Internal’s Focus Group augmented inspection and flaw evaluation guidelines for their RV internal components.

The staff reviewed the license renewal (LR) basis evaluation document as part of its review of the Reactor Vessel Internals Program to determine how the “scope of program” program element for the AMP compared with the staff’s recommendations in SRP-LR Section A.1.2.3.2. The staff also reviewed the LR basis evaluation document to determine whether the program elements for the Reactor Vessel

Internals Program would ensure adequate aging management of the RV internals components during the period of extended operation. From its review of this document, the staff concludes that the “scope of program” program element for the Reactor Vessel Internals Program includes Commitment No. 20 on implementation of this AMP. The staff noted that Commitment No. 20 provided in the Applicant’s letter NL-07-1261, dated June 27, 20071), required the applicant to commit to the following actions with respect to implementation of the Reactor Vessel Internals Program:

- commit to the MRP’s activities on RV internals, (2) commit to use the results from the MRP studies on RV internals and inspection and flaw evaluation (I&FE) guidelines as the basis for scheduling and implementing the inspections for the VEGP RV internals, and (3) commit to submitting an inspection plan for these components to the NRC for review and approval at least 2 years prior to entering the period of extended operation.

The staff noted that the provisions of Commitment No. 20 are consistent with the wording specified in the particular GALL Report AMR items that invoke the industry-wide activities for PWR RV internals. However, the staff also noted that the applicant is also relying on the Reactor Vessel Internals Program to manage loss of material and cracking in the Control Rod Drive (CRD) penetration nozzle thermal sleeves and in the RV attachments welds, lugs, and supports and that the applicant had indicated that these components are not within the scope of the MRP’s augmented aging studies for PWR. In this case, the staff concludes that the commitment as provided in the applicant’s letter dated June 27, 2007), did not indicate that the scope of the inspection plan for the VEGP RV internals would include the CRD penetration nozzle thermal sleeves and the RV attachment weld, lugs, and support pads.

The staff informed the applicant that, since the scope of the MRPs augmented aging studies did not cover CRD penetration nozzle thermal sleeves and the RV attachment weld, support lugs, and support pads, Commitment No. 20 would need to be supplemented to specifically indicate that the scope of the inspection plan would include augmented inspection activities for the CRD for these components. The staff asked the applicant to supplement the wording of Commitment No. 20 accordingly and to docket the revised version of the commitment.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant provided the text that will be added to the third part of the commitment. The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008 and incorporated the changes into Commitment No. 20, and is as follows:

Implement the Reactor Vessel Internals Program as described in LRA Section B.3.24

The program will be based on the following commitments:

- SNC will participate in the industry program for investigating and managing aging effects on reactor internals. This is an ongoing commitment.
- SNC will evaluate and implement the results of the industry programs, such the Electric Power Research Institute Material Reliability Program, as applicable to the VEGP reactor internals. This commitment will be fully the implemented prior to the period of extended operation.
- SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. This inspection plan will address the bases, inspection methods, and acceptance criteria associated with aging management of the reactor vessel thermal sleeves and the core support lugs (along with the associated support pads and attachment welds).

Based on the information reviewed in LRA Section B.3.24, Reactor Vessel Internals Program, the LR basis evaluation document for this AMP, and Commitment No. 20, the staff concludes that the “scope of program” program element is acceptable because:

- the scope of the program includes both those RV internals in which the AMR items for the component commodity groups in the LRA credit augmented inspection activities of the MRP Reactor Internal Focus Group, and the CRD penetration nozzle thermal sleeves and the RV core support attachment welds, lugs, and pads
- the applicant has to committed to participate in the MRP’s industry initiative studies for PWR RV internals, to use the results of these studies and the MRP’s recommended inspection and flaw evaluation (I&FE) guidelines as the basis for scheduling and implementing the inspections the VEGP RV internals, and to submit an inspection plan for the RV internals to the NRC for review and approval at least two (2) years prior to entering the period of extended operation
- the inspection plan for the RV internals will include augmented inspection activities for the control rod drive (CRD) penetration nozzle thermal sleeves and the RV core support attachments welds, lugs, and pads (which are not within the scope of MRP’s industry initiatives for PWR RV internals).
- the applicant’s inspection plan for the RV internals will be submitted to the NRC for review and approval at least two years prior to entering the period of extended operation

Based on this review, the staff concludes that the “scope of program” program element is acceptable and conforms to the staff’s recommendations in SRP-LR Section A.1.2.3.4 because: (1) the SRP-LR invokes the staff’s recommendation in the GALL Report, and (2) the applicant has, in Commitment No. 20, included an acceptable commitment to manage aging of the VEGP RV internals that is consistent with the staff's recommendations for PWR RV internals in the GALL Report. The staff confirmed that the "scope of the program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B.3.4 did not provide any "preventive actions" program element description for the Reactor Vessel Internals Program. The applicant provided this information in the LR basis evaluation document for the Reactor Vessel Internals Program.

SRP-LR Section A.1.2.3.2, "preventive actions" provides, in part, the following NRC guideline recommendations for AMP "preventative actions" program elements in plant-specific LRAs:

> The activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation.
>
> For condition or performance monitoring programs, they do not rely on preventive actions and thus, this information need not be provided. More than one type of aging management program may be implemented to ensure that aging effects are managed.

The staff reviewed the license renewal basis evaluation document as part of its review of the Reactor Vessel Internals Program to determine how the "preventive actions" program element for the AMP compared with the staff's recommendations in SRP-LR Section A.1.2.3.2. From its review of this document, the staff concludes that the "preventive actions" program element description in the LR basis document for the Reactor Vessel Internal Program indicated that the program does not rely on preventive actions to preclude aging effects from initiating or on mitigative activities to minimize the probability that aging effects will initiate in the RV internal components. The staff concurs that the Reactor Vessel Internals Program is a condition monitoring program that will implement the augmented inspections and flaw evaluation criteria defined and recommended by the MRP Reactor Internal Focus Group for PWR RV internals, and those VEGP-specific augmented inspection criteria for the Control Rod Drive (CRD) penetration nozzle thermal sleeves and the RV core support attachments welds, lugs, and pads. As such, the staff concludes that the Reactor Vessel Internals Program does not include specific preventive or mitigative activities.

The applicant's Water Chemistry Control Program (LRA Section B.3.28) is designed to mitigate the probability that aging effects induced by chemical or corrosive aging mechanisms, such loss of material induced by pitting or crevice corrosion or cracking induced by stress corrosion cracking (SCC, including irradiation-assisted stress corrosion cracking [IASCC] or primary water stress corrosion cracking [PWSCC]), will initiate in the plant systems exposed to aqueous environments. The staff evaluated the ability of the Water Chemistry Control Program to mitigate the aging effects that may potentially be induced by chemical or corrosive aging mechanisms in SER Section 3.0.3.1.4.

Based on this assessment, the staff confirmed that the “preventive actions” program element does not need to satisfy the “preventive actions” program element criterion defined in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.3.4 did not provide any “parameters monitored or inspected” program element description for the Reactor Vessel Internals Program. The applicant provided this information in the LR basis evaluation document for the Reactor Vessel Internals Program.

SRP-LR Section A.1.2.3.3, “parameters monitored or inspected” provides the following recommendation for “parameters monitored or inspected” program elements for condition monitoring-based AMPs:

> For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. Some examples are measurements of wall thickness and detection and sizing of cracks.

The staff reviewed the LR basis evaluation document as part of its review of the Reactor Vessel Internals Program to determine how the “parameters monitored or inspected” program element for the AMP compared with the staff’s recommendations in SRP-LR Section A.1.2.3.3. From its review of this document, the staff concludes that the “parameters monitored or inspected” program element in the LR basis document indicated that the parameters monitored will be based on the results of industry initiatives on internals and that inspection techniques will be selected on the ability to detect evidence of age-related degradation, including cracking due to SCC, IASCC, PWSCC, or cyclical loading, loss of material due to mechanisms such as wear, and changes in dimension due to void swelling. The “parameters monitored or inspected” program element also indicated that the program will indirectly be used to manage potential loss (reduction) of fracture toughness that may be induced by either neutron irradiation embrittlement, void swelling, or thermal aging in components made from CASS or martensitic materials by using inspection techniques that are capable of detecting cracks in the component materials. The aging effects are consistent with the aging effects identified in the specific AMR items in GALL Report Table IV.B2 that recommend using the MRP Reactor Vessel Internal Focus Group industry initiatives for aging management of Westinghouse PWR RV internals.

The staff has verified that Reactor Vessel Internals Program is based on implementation of Commitment No. 20, which was docketed in the applicant’s letter dated March 20, 2008. In this letter, the applicant committed to participate in and to implement the inspections that are recommended by the MRP Reactor Vessel Internal Focus Group to manage these aging effects prior to a loss of component intended function. This is acceptable because the AMRs in the GALL Report permit applicant’s to use the industry initiatives of the MRP Reactor Vessel Internal Focus Group for aging management if their LRAs are docketed to include a commitment in the UFSAR Supplement to:

(1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) 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, submit an inspection plan for reactor internals to the NRC for review and approval. This inspection plan will address the bases, inspection methods, and acceptance criteria associated with aging management of the reactor vessel thermal sleeves and the core support lugs (along with the associated support pads and attachment welds.

The staff has verified that LRA Commitment No. 20 includes these elements, and that the commitment states that the inspection plan for the RV internals will include VEGP-specific inspection criteria for manage wear in the VEGP control rod drive (CRD) penetration nozzle thermal sleeves and cracking of the RV core support attachments welds, lugs, and pads.

Based on this review, the staff concludes that the "parameters monitored or inspected" program element is acceptable and conforms to the staff's recommendations in SRP-LR Section A.1.2.3.3 because: (1) the SRP-LR invokes the staff's recommendation in the GALL Report, and (2) the applicant has, in Commitment No. 20, included an acceptable commitment to manage aging of the VEGP RV internals that is consistent with the staff's recommendations for PWR RV internals in the GALL Report. The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in the in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.3.4 did not provide any "parameters monitored or inspected" program element description for the Reactor Vessel Internals Program. The applicant provided this information in the LR basis evaluation document for the Reactor Vessel Internals Program.

SRP-LR Section A.1.2.3.4, "detection of aging effects" provides the following recommendation for "detection of aging effects" program elements for condition monitoring-based AMPs:

> Detection of aging effects should occur before there is a loss of the structure and component intended function(s). The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects. Provide information that links the parameters to be monitored or inspected to the aging effects being managed.

The staff reviewed the LR basis evaluation document as part of its review of the Reactor Vessel Internals Program to determine how the "detection of aging effects" program element for the AMP compared with the staff's recommendations in SRP-

LR Section A.1.2.3.4. From its review of this document, the staff concludes that the "detection of aging effects" program element description in the LR basis evaluation identifies that the inspection techniques for the RV internals include those inspection techniques described in MRP-153, and that these techniques include visual examination techniques (VT-1 and EVT-1) and volumetric examination techniques such as radiography (RT), ultrasonic testing (UT), and eddy current testing (ET). The program element clarifies that these inspection techniques will be selected, based on the Material Reliability Project Reactor Vessel Internal Focus Group recommendations, to detect component degradation before critical flaw sizes, wall thicknesses, or dimensions are exceeded. This is acceptable because the AMRs in Section IV.B2 of the GALL Report permit Westinghouse-design applicants to use the industry initiatives of the MRP Reactor Vessel Internal Focus Group for aging management if their LRAs are docketed to include a commitment in the UFSAR Supplement to:

> (1) participate in the industry programs for investigating and managing aging effects on reactor internals; (2) 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, submit an inspection plan for reactor internals to the NRC for review and approval.

The staff has verified that LRA Commitment No. 20 includes these elements.

The staff concludes that the "detection of aging effects" program element description in the LR basis evaluation document also stated that loss of fracture toughness cannot be managed by direct monitoring, and that if required by the MRP component functionality evaluation, the examination techniques specified to manage loss of fracture toughness will focus on detection of cracking before a crack grows beyond the critical flaw size that was calculated in the limiting fracture toughness study.

The staff concludes that this is acceptable because: (1) the AMRs in Section IV.B2 of the GALL Report establish the NRC's position that Westinghouse-design applicants may use the industry initiatives and recommendations of the MRP Reactor Vessel Internal Focus Group as an option to manage the aging effects that are applicable to their PWR RV internals, if committed to in the UFSAR Supplements of their LRAs, (2) the MRP Reactor Vessel Internal Focus Group industry initiatives include recommended inspection techniques to detect cracking prior to a loss of component intended function, (3) the industry initiatives include studies to account for the impact that neutron irradiation embrittlement, void swelling, and thermal aging (for CASS components) could have on the fracture toughness and hence critical crack size of the materials used to fabricate the RV internals, (4) the applicant has, in Commitment No. 20, committed to participate in the MRP's industry initiatives and studies on PWR RV internals and to apply and implement the MRP recommendations for PWR RV internals to the specific internals at VEGP, (5) the applicant has, in Commitment No. 20, committed to submit an inspection plan for its RV internals to the NRC for review and approval at least two years prior to entering the period of extended operation and (6) the inspection plan to be submitted to the NRC for review and approval will include specific VEGP-proposed inspection methods for detecting loss of material due wear in the VEGP control rod drive (CRD) penetration nozzle thermal sleeves and cracking of the RV core support attachments welds, lugs, and pads.

Based on this review, the staff concludes that the "detection of aging effects" program element is acceptable and conforms to the staff's recommendations in SRP-LR Section A.1.2.3.4 because: (1) the SRP-LR invokes the staff's recommendation in the GALL Report, and (2) the applicant has, in Commitment No. 20, included an acceptable commitment to manage aging of the VEGP RV internals that is consistent with the staff's recommendations for PWR RV internals in the GALL Report. The staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.3.4 did not provide any "monitoring and trending" program element description for the Reactor Vessel Internals Program. The applicant provided this information in the LR basis evaluation document for the Reactor Vessel Internals Program.

SRP-LR Section A.1.2.3.5, "monitoring and trending" provides the following recommendation for the "monitoring and trending" program elements for preventative/mitigative-based, condition monitoring-based, and performance-monitoring-based AMPs:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency.
>
> This program element describes "how" the data collected are evaluated and may also include trending for a forward look. This includes an evaluation of the results against the acceptance criteria and a prediction regarding the rate of degradation in order to confirm that timing of the next scheduled inspection will occur before a loss of SC intended function. Although aging indicators may be quantitative or qualitative, aging indicators should be quantified, to the extent possible, to allow trending. The parameter or indicator trended should be described. The methodology for analyzing the inspection or test results against the acceptance criteria should be described. Trending is a comparison of the current monitoring results with previous monitoring results in order to make predictions for the future.

The staff reviewed the LR basis evaluation document as part of its review of the Reactor Vessel Internals Program to determine how the "monitoring and trending" program element for the AMP compared with the staff's recommendations in SRP-LR Section A.1.2.3.5. From its review of this document, the staff concludes that the "monitoring and trending" program element description in the LR basis evaluation states that the applicant will implement industry developed I&FE guidelines (as applicable to the VEGP RV internal designs) to ensure adequate monitoring and trending so that a loss of component intended function does not occur prior to the end of the period of extended operation. The staff concludes that the program element description also states: (1) that MRP-152 provides preliminary industry guidance related to inspection intervals, with the inspections for most components most likely to conform to a schedule that conforms to that in the ASME Code Section XI, Paragraph IWB-2430, and (2) that components with detected flaws or postulated high crack growth rates may result in more frequent inspections frequencies.

The staff also determined that the program element description states that, for those components not subject to the MRP program, SNC will address the inspection frequencies based on industry experience, VEGP specific data, and vendor evaluations and recommendations.

Based on this review, The staff finds the applicant's bases for its "monitoring and trending" program element to be acceptable because the applicant has, in Commitment No. 20, committed to: (1) participate in the MRP's activities on RV internals, (2) use the results MRP studies on RV internals and inspection and flaw evaluation (I&FE) guidelines as the basis for establishing and frequency for, scheduling and implementing its inspections the VEGP RV internals, and (3) submit an inspection plan for these components to the NRC for review and approval at least 2 years prior to entering the period of extended operation, including specific inspection plans for managing loss of material due wear in the VEGP control rod drive (CRD) penetration nozzle thermal sleeves and cracking of the RV core support attachments welds, lugs, and pads. This is LRA Commitment No. 20.

Based on this review, the staff concludes that the "monitoring and trending" program element is acceptable and conforms to the staff's recommendations in SRP-LR Section A.1.2.3.5 because: (1) the SRP-LR invokes the staff's recommendation in the GALL Report, and (2) the applicant has, in Commitment No. 20, included an acceptable commitment to manage aging of the VEGP RV internals that is consistent with the staff's recommendations for PWR RV internals in the GALL Report. The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.3.4 did not provide any "acceptance criteria" program element description for the Reactor Vessel Internals Program. The applicant provided this information in the LR basis evaluation document for the Reactor Vessel Internals Program.

SRP-LR Section A.1.2.3.6, "acceptance criteria" provides the following recommendation for the "acceptance criteria" program elements for preventative/mitigative-based, condition monitoring-based, and performance-monitoring-based AMPs:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions during the

> period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria. Corrective action is taken, such as piping replacement, before reaching this acceptance criterion. This acceptance criterion should provide for timely corrective action before loss of intended function under these CLB design loads.
>
> Acceptance criteria could be specific numerical values, or could consist of a discussion of the process for calculating specific numerical values of conditional acceptance criteria to ensure that the structure and component intended function(s) will be maintained under all CLB design conditions. Information from available references may be cited . . . . It is not necessary to justify any acceptance criteria taken directly from the design basis information that is included in the UFSAR because that is a part of the CLB. Also, it is not necessary to discuss CLB design loads if the acceptance criteria do not permit degradation because a structure and component without degradation should continue to function as originally designed.
>
> Acceptance criteria, which do permit degradation, are based on maintaining the intended function under all CLB design loads.

The staff reviewed the LR basis evaluation document as part of its review of the Reactor Vessel Internals Program to determine how the “acceptance criteria” program element for the AMP compared with the staff’s recommendations in SRP-LR Section A.1.2.3.6. From its review of this document, the staff concludes that the “acceptance criteria” program element description states the program will be based on the results of the MRP studies on PWR RV internals and will implement the MRP’s recommended acceptance criteria for RV internals. The staff also determined that the program element states that: (1) when the MRP program is completed, the program will include applicable acceptance criteria recommendations for critical component flaw sizes, wall thicknesses, and critical dimensions, with adequate margins to address detection limitations, flaw sizing uncertainties, conservatively postulated crack growth rates, and other uncertainties, and (2) when examinations result in the detection of flaws, MRP-153 provides the MRP’s preliminary industry guidance regarding flaw tolerance evaluations for PWR RV internals. The staff finds these bases to be acceptable because: (1) the applicant’s bases are consistent with the AMR line items for RV internals that invokes this industry-wide integrated approach to RV internal components, and (2) the applicant has, in Commitment No. 20, committed to participation in the MRP’s industry studies and activities on PWR RV internals, to use and implement the results and recommendations of the MRP’s inspection and flaw evaluation (I&FE) guidelines as the basis for evaluating any relevant indications in the VEGP RV internals. The staff verified that the applicant has included this commitment in LRA Commitment No. 20.

The staff also determined that the program element states that: (1) for inspections of the RV core support lugs, pads, and attachment welds, any relevant flaw indications will be compared to applicable flaw acceptance criteria in the ASME Section XI for category B-N-2 component inspection items or in accordance with more restrictive guidance, (2) the acceptance criteria for these components will be included in the inspection plan that will be submitted to the NRC for review and approval, and (3) for the RV closure head thermal sleeves, the limits on acceptable wall loss (as a result of wear) will be compared to minimum values established by the program and based on VEGP specific data and wear rate trending. This is acceptable because the applicant has, in Commitment 20, committed to submitting the bases, inspection methods, and acceptance criteria for the control rod drive penetration nozzle thermal sleeves, and the RV core support lugs, pads, and attachments as part of the RV internal inspection plan that will be submitted to the NRC for review and approval. The staff verified that the applicant has included this commitment in LRA Commitment No. 20.

Based on this review, the staff concludes that the "acceptance criteria" program element is acceptable and conforms to the staff's recommendations in SRP-LR Section A.1.2.3.6 because: (1) the SRP-LR invokes the staff's recommendation in the GALL Report, and (2) the applicant has, in Commitment No. 20, included an acceptable commitment to manage aging of the VEGP RV internals that is consistent with the staff's recommendations for PWR RV internals in the GALL Report. The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.3.24 states that the new Reactor Vessel Internals Program has no programmatic history. The program will be based upon industry operating experience, research data, and vendor evaluations.

Development of the program will rely upon the consensus opinion of the EPRI MRP Reactor Internals Focus Group, which includes utility representatives, research scientists, and vendors. For the reactor vessel thermal sleeves, program development will be based on plant-specific data and on vendor recommendations.

The applicant stated that the Unit 2 Spring 2007 refueling outage found a number of reactor vessel head thermal sleeves to have experienced wear up to 360 ° around the thermal sleeve where it exits the bottom end of the control rod drive mechanism penetration tube. Wear was more severe at unrodded than at rodded locations. Initial evaluation attributes the wear to contact with the penetration tubes due to flow-induced oscillations. The wear was of varying magnitudes, significant at nine locations and minimal at twenty-three locations. Because of these wear indications, lower sections of the four thermal sleeves experiencing the most extensive wear were removed up to points well above the vessel penetration weld.

All four of the removed sleeves were in unrodded penetration locations. The remaining thermal sleeves will be re-inspected at the next scheduled refueling outage, at which time; assessments will determine additional monitoring requirements and corrective actions. Earlier in plant life, VEGP preemptively replaced the original Units 1 and 2 Alloy X-750 control rod guide tube support pins with strain-hardened Type 316 stainless steel support pins based on industry experience with PWSCC in Alloy X-750 support pins.

SRP-LR Section A.1.2.3.10, “operating experience” provides the following recommendation for the “operating experience” program elements for preventative/mitigative-based, condition monitoring-based, and performance-monitoring-based AMPs:

> Operating experience with existing programs should be discussed. The operating experience of aging management programs, including past corrective actions resulting in program enhancements or additional programs, should be considered. A past failure would not necessarily invalidate an aging management program because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information can show where an existing program has succeeded and where it has failed (if at all) in intercepting aging degradation in a timely manner. This information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The staff reviewed the applicant’s program documents and the operating experience document for the Inservice Inspection Program to determine how the “operating experience” program element for the Reactor Vessel Internals Program compared with the staff’s recommendations in SRP-LR Section A.1.2.3.10 and to determine whether the applicant’s program was capable of addressing relevant operating experience for PWR RV internals, including both existing and potential operating experience, and both generic and VEGP-specific operating experience with PWR RV internals. The staff verified applicant’s operating experience program element does address both existing and potential, and VEGP-specific and generic operating experience on aging of PWR RV internals that the industry is concerned about and is currently studying through the industry studies and initiatives of the MRP. These initiatives include studies on PWR former and baffle bolts, stainless steel and inconel (Alloys 600 and 690 base metal materials, and Alloy 82, 182, 52, or 152 weld filler metal materials) RV internals, and RV internals made from martensitic, precipition-hardened, and strain hardened steel, all of which may be potentially susceptible to stress-corrosion induced cracking (including potential irradiation-assisted stress corrosion cracking); loss of fracture due to neutron irradiation embrittlement, potential void swelling or, for cast austenitic stainless steels (CASS) due to thermal aging; changes in dimensions due to void swelling; and for bolted, keyed, or pinned RV internal connections loss of preload due to stress relaxation (including irradiation-assisted stress relaxation).

The staff has verified that, to address existing and potential VEGP-specific and generic operating experience that is applicable to the VEGP RV internals, the applicant has, in Commitment No. 20, committed to: (1) participating in the MRP industry-wide studies and initiatives for PWR RV internals, (2) implementing the bases, inspection criteria and recommendations, and flaw evaluation criteria and recommendations that are developed by the MRP for PWR RV internals to the inspection, monitoring and trending, and evaluation of the RV internals for the VEGP units, and (3) for these components, to submit an inspection for these components to the NRC for review and approval at least two years prior to entering the period of extended operation. The staff's has included its bases for accepting the AMP based on the provisions of the Commitment, as assessed by the staff in its evaluations for the previous program elements for this AMP. Based on this assessment, the staff concludes that the applicant, through its commitment to the MRP activities, has provided an acceptable basis for addressing both existing and potential, and VEPG-specific and generic operating experience for the VEGP RV internals that are within the scope of the MRP's industry initiatives and studies for PWR RV internals.

The staff also verified that the "operating experience" program element for the Reactor Vessel Internals Program did discuss and address VEGP-specific experience with wear in the control rod drive penetration nozzle thermal sleeves and potential operating experience with cracking of the VEGP RV core support lugs, pads, and attachments. The staff noted that the "operating experience" program element description for this AMP did identify that these components are not within the scope of the MRP's industry initiatives and did an acceptable job of discussing the causes and steps taken by the applicant to address the experience.

Based on this review, the staff concludes that the "operating experience" program element is acceptable and conforms to the staff's recommendations in SRP-LR Section A.1.2.3.10 because: (1) the SRP-LR contains the staff's recommendation in the GALL Report, (2) the applicant has, in Commitment No. 20, included an acceptable commitment to manage aging of the VEGP RV internals that is consistent with the staff's recommendations for PWR RV internals in the GALL Report, (3) Commitment No. 20 as proposed by the applicant and accepted by the staff includes provisions to submit and inspection plan for the VEGP RV internals to the staff for review and approval, and (4) the inspection, when submitted will include appropriate inspection and flaw evaluation criteria for both the components assessed by the MRP initiates on PWR RV internals and the control rod drive penetration nozzle thermal sleeves and RV core support lugs, pads, and attachments, which are not within the scope of the MRP's industry studies and initiatives on PWR RV internals. The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.24, the applicant provided the UFSAR supplement for the Reactor Vessel Internals Program. The staff verified that Commitment No. 20, when implemented, is consistent with the staff's recommendations for managing aging in PWR RV internals that are described in the specific AMRs for these components in the GALL Report, and that Commitment No. 20 referenced that the commitment is applicable to UFSAR Section A.2.2.4 and LRA Section B.3.4 for the Reactor Vessel Internals 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 Reactor Vessel Internals Program, the staff concludes that the applicant has demonstrated that 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.8 Steam Generator Program for Upper Internals

Summary of Technical Information in the Application LRA Section B.3.27 describes the existing Steam Generator Program for Upper Internals as a plant-specific program.

The applicant stated that the Steam Generator Program for Upper Internals is an existing plant-specific subprogram of the Steam Generator Program, an integrated program for managing the condition of the SGs. The Steam Generator Program conforms to the program described in NEI 97-06, "Steam Generator Program Guidelines." The Steam Generator Program for Upper Internals includes Steam Generator Program activities for aging management of the SG upper internals components within the scope of license renewal.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.27 on the applicant's demonstration of the Steam Generator Program for Upper Internals 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 Steam Generator Program for Upper Internals against the staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Steam Generator Program for Upper Internals would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

The applicant indicated that program elements (7) "corrective actions," (8) "confirmation process," and (9) "administrative controls" 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 the Program - LRA Section B.3.27 states that the program scope includes the following components:

- Auxiliary Feedwater Spray Piping
- Auxiliary Feedwater Nozzle Thermal Sleeve
- Feedwater Distribution Assembly Piping and Fittings
- Feedwater Inlet Nozzle
- Feedwater Inlet Nozzle Thermal Sleeve
- Feedwater J-Tubes
- Moisture Separator Assembly - Primary
- Moisture Separator Assembly - Secondary

The staff reviewed the applicant's program basis documents for this program that adequately identified all the components within the scope of this AMP. The staff confirmed that the specific components for which the program manages aging effects are identified, which satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds the applicant's scope of the program acceptable

(2) Preventive Actions - LRA Section B.3.27 states that, consistent with NEI 97-06, the program relies upon water chemistry controls to prevent or mitigate degradation mechanisms or to reduce degradation rates.

These secondary-side chemistry controls are parts of the Water Chemistry Control Program. The Water Chemistry Control Program is an existing program that mitigates loss of material, cracking, and reduction in heat transfer in system components and structures through the control of water chemistry. The program includes control of detrimental chemical species and the addition of chemical agents.

The staff confirmed that the "preventive actions" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B.3.27 states that the Steam Generator Program for Upper Internals includes inspection activities detect degradation of secondary side internals needed to maintain tubing integrity and accomplish SG intended functions. An assessment based upon SG design, potential degradation mechanisms, and related plant-specific and industry operating experience establishes for secondary side internals components inspection requirements incorporated into the SG inspection plans.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B.3.27 states that the SG tubing eddy current testing data indicate some secondary-side conditions *(e.g.*, evidence of loose parts); however, detection of aging effects in the SG secondary-side internals

is primarily through the use of visual inspections. The program considers Industry and plant-specific operating experience from prior inspections and cleaning activities (*e.g.*, sludge lancing, sludge collector cleaning, etc.) in establishing secondary-side inspection requirements. Inspection of SG secondary-side components is as needed to assess conditions or evaluate potential degradation mechanisms. Visual inspections are adequate to detect loss of material and cracking of SG internal support structures before any detrimental impact on tube integrity. Various tools and techniques are available for visual inspection of secondary side components; however, the choice of visual tools and techniques varies with the points of interest for the inspection.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B.3.27 states that consistent, with NEI 97-06, the program monitors secondary side SG components the failure of which could prevent the SG from fulfilling its intended safety-related function. NEI 97-06 states, "The monitoring shall include design reviews, an assessment of potential degradation mechanisms, industry experience for applicability, and inspection, as necessary, to ensure degradation of these components does not threaten tube structural integrity and leakage integrity or the ability of the plant to achieve and maintain safe shutdown." Inspection requirements are based upon the results of an assessment of SG design, potential degradation mechanisms, and plant-specific and industry operating experience. The program documents inspection results and, when appropriate, uses trends to alter requirements for subsequent inspections.

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.5.

The staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B.3.27 states that acceptance criteria for inspections of secondary side components are based on the inspection method and engineering evaluation. Visual inspections typically use qualitative criteria for detecting degradation sufficient to warrant further evaluation that may involve additional inspection and engineering to quantify the extent of degradation (*e.g.*, ultrasonic testing to determine actual wall thickness and engineering to compare the results to the design requirements). Corrective actions can include follow-up inspections to assess the rate of degradation, repair or replacement of the degraded component, or other appropriate action. Any rate of degradation that could cause a loss of SG tube integrity or loss of intended function prior to the next scheduled inspection is unacceptable. When inspection results do not satisfy established acceptance criteria, the program initiates corrective actions The VEGP corrective actions program is consistent with the corrective actions described in Branch Technical Position RLSB-1 in SRP-LR Appendix A.1 and 10 CFR Part 50, Appendix B.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - LRA Section B.3.27 states that the program incorporates new industry operating experience and research data for periodic program improvement. EPRI SG guidelines forming the technical basis for the program and updated periodically by EPRI are results of a consensus process. The Steam Generator Program is in accordance with general requirements for engineering programs. Periodic program reviews and assessments ensure compliance with regulatory, process, and procedural requirements. Recent Steam Generator Program performance results show that the program effectively finds and corrects degradation attributable to AERMs. The 2000 Unit 1 SG upper internals inspection observed minor degradation on the feedwater distribution assembly and on one primary moisture separator assembly. The 2002 Unit 2 SG upper internals inspection observed minor degradation on the feedwater distribution assembly. In 2004, an extensive engineering review of the SG secondary side conditions and related inspection requirements considered the 2000 and 2002 observations and concluded that the degradation was minor and insignificant in industry experience.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.27, the applicant provided the UFSAR supplement for the Steam Generator Program for Upper Internals. 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 Steam Generator Program for Upper Internals, the staff concludes that the applicant has demonstrated that 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.9 Inservice Inspection Program - IWE

Summary of Technical Information in the Application LRA Section B.3.30 describes the existing Inservice Inspection Program - IWE as a plant-specific program.

The applicant stated that the Inservice Inspection (ISI) Program - IWE is in accordance with 10 CFR 50.55(a), which imposes the ISI requirements of ASME Code Section XI, Subsection IWE. The Inservice Inspection Program - IWE manages aging effects for the containment liners and attachments including connecting penetrations and parts forming the leak-tight boundary. The primary inspection method for the ASME Section XI, Subsection IWE Program is periodic visual examination with limited volumetric examinations utilizing ultrasonic thickness measurements as needed.

The applicant also stated that in accordance with 10 CFR 50.55a(g)(4)(ii) and as based on ASME Code Inservice Inspection Program B (IWA-2432), the Inservice Inspection Program - IWE updates at the end of each 120-month inspection interval to the latest code edition and addenda specified in 10 CFR 50.55a twelve months before the start of the next inspection interval. The program's second inspection interval ended in May 2007. The third ISI interval requirements are based on ASME Code Section XI, 2001 Edition including the 2002 and 2003 Addenda.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.30 on the applicant's Inservice Inspection Program - IWE 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 - IWE against the staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Inservice Inspection Program - IWE would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program - The "scope of the program" program element criterion in SRP-LR Section A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

    The applicant states in LRA Section B.3.30 that the Inservice Inspection Program - IWE is credited for managing aging effects for:

    - The metallic liners (including their integral attachments) for the concrete containments
    - The penetration sleeves including the personnel airlocks, emergency airlocks, and equipment hatches
    - The pressure-retaining bolted connections within the boundary of the concrete containment vessels
    - The seals, gaskets, and moisture barriers

    The staff concludes that the specific components (metallic liners and integral attachments, penetration sleeves, pressure-retaining bolted connections, seals, gaskets, moisture barriers) for which the program manages aging effects are identified, which satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds the applicant's scope of the program acceptable.

The staff confirmed that the "scope of the program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions – The "preventive actions" program element criterion in SRP-LR Section A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

The applicant states in LRA Section B.3.30 that the condition-monitoring Inservice Inspection Program - IWE includes no preventive actions.

The staff finds this program element 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.

The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2.

(3) Parameters Monitored or Inspected - The "parameters monitored or inspected" program element criterion in SRP-LR Section A.1.2.3.3 are:

> The parameter to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameters monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.3.30 that the program inspects the primary containment and its attachments for evidence of cracks, wear, and corrosion.

The program monitors loss of material of the containment liners and attachments by inspecting surfaces for visual evidence of flaking, blistering, peeling, discoloration, and other signs of distress.

During the audit and review, the staff asked the applicant to explain why the Inservice Inspection Program - IWE program element "parameters monitored or inspected" does not appear to credit any inspection of non-coated primary containment surfaces and also clarify whether or not this program credits the requirements of ASME Section XI, paragraph IWE-2310 to monitor for evidence of discoloration, pitting, gouges, surface discontinuities, dents, and other signs of surface irregularities in non-coated containment liner areas.

In its response, the applicant stated that the Inservice Inspection Program - IWE is credited for inspection of non-coated containment liner areas. The inspection of non-coated areas examines for evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents and other signs of surface irregularities, which includes the requirements of ASME Section XI, paragraph IWE-2310.

The applicant also noted that the visible VEGP primary containment and attachments steel surfaces are coated with a qualified coating. VEGP does not credit coatings for aging management. The protective effects of coatings are not credited when the aging effects requiring management are determined for the underlying component materials. The Inservice Inspection Program - IWE inspections of these coated containment liner surfaces, which examine for evidence of flaking, blistering, peeling, discoloration, and other signs of distress, are credited for license renewal for identify potential degradation of the underlying liner material.

The staff finds the program element acceptable on the basis that the applicant inspects the primary containment and its attachments for evidence of cracks, wear, and corrosion by monitoring coated surfaces for visual evidence of flaking, blistering, peeling, discoloration, and other signs of distress. The applicant also examines non-coated areas for evidence of cracking, discoloration, wear, pitting, excessive corrosion, arc strikes, gouges, surface discontinuities, dents and other signs of surface irregularities.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - The “detection of aging effects” program element criteria in SRP-LR Section A.1.2.3.4 are:

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> Describe when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program)
>
> Link the method for the inspection population and sample size when sampling is used to inspect a group of SCs. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The applicant states in LRA Section B.3.30 that the Inservice Inspection Program - IWE manages loss of material and cracking for the primary containment and its integral attachments. The primary inspection method is visual examination either directly or remotely with sufficient illumination and suitable resolution for the 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 containment structure wall thickness.

The staff finds it acceptable on the basis that the applicant uses visual examination either directly or remotely with sufficient illumination for the environment to detect degraded conditions that may affect the containment structural integrity or leak tightness. The applicant uses ultrasonic examinations to measure containment liner wall thickness.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - The “monitoring and trending” program element criteria in SRP-LR Section A.1.2.3.5 are:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> This program element should describe how the data collected is evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

The applicant states in LRA Section B.3.30 that the program establishes inspection frequencies for each inspection interval consistent with ASME Code Section XI as specified in 10 CFR 50.55a(g)(4)(ii). Currently, the Inservice Inspection Program is based on ASME Code Inservice Inspection Program B (IWA-2432). The program compares results to baseline data and other previous test (inspection) results and evaluates indications in accordance with ASME Code Section XI. If the component qualifies with the indication as acceptable for continued service, the program reexamines the area of the indication during subsequent inspections. Examinations that reveal indications that exceed acceptance standards are extended to include additional examinations in accordance with ASME Code Section XI.

The staff finds this acceptable on the basis that the program has established inspection frequencies for each inspection interval and inspection results are compared to baseline results and other previous test results for trending. For components with qualified indications for continued service, the program reexamines the area of the indication in later inspections. Component examinations are extended in areas where indications exceed acceptance standards.

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - The “acceptance criteria” program element criteria in SRP-LR Section A.1.2.3.6 are:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s)

are maintained under all CLB design conditions during the period of extended operation.

The applicant states in LRA Section B.3.30 that a pre-service or baseline inspection of program components prior to startup assured freedom from defects greater than code-allowable. The program compares results of inservice inspections to baseline data, other previous test (inspection) results, and acceptance criteria of the ASME Code Section XI standards. ASME Code Section XI, Article IWE-3000 defines Inservice Inspection Program - IWE acceptance standards as applicable.

The staff concludes that this program element is acceptable on the basis that acceptance criteria is based on a comparison of inservice inspections to baseline data, other previous test (inspection) results, and the acceptance criteria of the ASME Code Section XI, Subsection IWE.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - The “operating experience” program element criterion in SRP-LR Section A.1.2.3.10 is:

> The operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states in LRA Section B.3.30 that the Inservice Inspection Program – IWE is in accordance with general requirements for engineering programs. Program reviews ensure compliance with regulatory, process, and procedural requirements. ASME Boiler and Pressure Vessel Code Section XI is a consensus document periodically revised to reflect updated guidance based in part on industry operating experience. Inservice Inspection Program – IWE upgrades are based on industry and plant-specific operating experience. Additionally, plant-specific operating experiences are shared among personnel of all three applicant plant sites and corporate offices.

The applicant stated that in 2004 during 2R10, an IWE inspection detected corrosion on the containment liner plate at a few locations and entered it into the Corrective Action Program, which repaired some corrosion locations and evaluated most of the corrosion on the containment liner plate as cosmetic requiring no repair. In 2006 during 1R13, IWE visual inspections detected surface rust anomalies on the Unit 1 containment liner plate and entered them into the Corrective Action Program, which has recommended surface recoating and generated an action Item to track the completion. The applicant further stated that industry and plant-specific operating experience demonstrate that the program is effective in detection and management of aging effects so components crediting this program can perform their intended function consistent with the CLB during the period of extended operation.

During the audit and review, the staff noted that the detection of aging effects program element for GALL AMP XI.S1, ASME Section XI, Subsection IWE; states that ASME Section XI paragraph IWE-1240 requires augmented examinations of containment surface areas that are subject to degradation. The staff asked the applicant to explain historically what inspection findings under the VEGP Inservice Inspection Program - IWE, have lead to the need for augmented inspections. The applicant was also asked to explain if any augmented inspections are currently being performed on the containment surfaces, and if so, clarify the containment locations within the scope of the augmented inspections and what the inspections involve.

In its response, the applicant stated that IWE-1241 requires augmented examinations of interior and exterior containment surface areas subjected to (a) accelerated corrosion with no or minimal corrosion allowance, and (b) excessive wear from abrasion or erosion that causes a loss of protective coatings, deformation, or material loss. The VEGP IWE inspections have not identified any areas which require augmented examination.

The applicant also stated that although not an augmented inspection, the liner plate was examined following the removal of a portion the moisture seal. As identified in the 1R9 NIS (Nuclear Inspection Service) Report, a small area of the moisture seal was removed following the identification of surface rust at the mating surface between the moisture seal and the containment liner plate. The liner plate was examined following the removal of the moisture seal and no liner plate damage was found. As a good practice since 1R9, VEGP performs a VT-3 of 100% of the moisture barrier every period and UT measurements of liner plate thickness at different locations.

The staff finds the applicant’s response acceptable because it explains that the VEGP IWE inspections have not identified any areas which require augmented examination, indicating containment liner aging is being managed well by the program.

During the audit and review, the staff reviewed a sample of the operating experience referenced in the basis document for the Inservice Inspection Program – IWE and in the LRA. The staff also reviewed a sample of condition reports. For example, in one condition report reviewed by the staff, the condition report identified corrosion in multiple locations around the Unit 2 moisture barrier between the base mat and liner plate at elevation 171 foot. The corrosion was identified under the Inservice Inspection Program - IWE. The condition was evaluated and determined to be nonstructural with no effect on the structural integrity of the containment. The condition was to be reexamined during the next inspection period in accordance with the ASME code. No further condition reports were written on the original finding. In another condition report, the applicant identified surface rust anomalies on the Unit 1 containment liner plate during IWE visual inspections on level 2 and level 3. The condition was determined to be acceptable until recoating of the surface could be performed during the next refueling outage.

The staff finds that the review of the operating experience documented in the basis document for the Inservice Inspection Program – IWE did not reveal any unusual or significant findings.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.30, the applicant provided the UFSAR supplement for the Inservice Inspection Program - IWE. 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 - IWE, the staff concludes that the applicant has demonstrated that 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.10 Inservice Inspection Program - IWL

Summary of Technical Information in the Application LRA Section B.3.31 describes the existing Inservice Inspection Program - IWL as a plant-specific program.

The applicant stated that the Inservice Inspection Program - IWL is in accordance with 10 CFR 50.55(a), which imposes the ISI requirements of ASME Code Section XI, Subsection IWL, for Class CC components.

The program manages the reinforced concrete and unbonded post-tensioning systems of the containment structures.

The applicant also stated that in accordance with 10 CFR 50.55a(g)(4)(ii) and as based on ASME Code Inservice Inspection Program B (IWA-2432), the Inservice Inspection Program - IWL is updated at the end of each 120-month inspection interval to the latest edition and addenda of the Code specified in 10 CFR 50.55a twelve months before the start of the next inspection interval. The program’s second inspection interval ended in May 2007. The third ISI interval requirements are based on the ASME Code, Section XI, 2001 Edition including the 2002 and 2003 Addenda.

Staff Evaluation In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B.3.31 on the applicant’s Inservice Inspection Program - IWL 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 - IWL against the staff’s recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Inservice Inspection Program - IWL would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program - The "scope of the program" program element criterion in SRP-LR Section A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

    The applicant states in LRA Section B.3.31 that the Inservice Inspection Program - IWL, under ASME Code Section XI, Subsection IWL, manages reinforced concrete and unbonded post-tensioning systems of Class CC containments. The primary containment is a prestressed concrete post-tensioned system. The containment structure construction code is ASME Code Section III, 1977 Edition. The ASME Code Section XI inspection categories credited for license renewal are all applicable IWL examination categories L-A and L-B.

    The staff concludes that the specific components (reinforced concrete and unbonded post-tensioning systems of Class CC containments) for which the program manages aging effects are identified, which satisfies the criterion defined in SRP-LR Section A.1.2.3.1. On this basis, the staff finds the applicant's "scope of the program" element acceptable.

    The staff confirmed that the "scope of the program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions – The "preventive actions" program element criterion in SRP-LR Section A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

    The applicant states in LRA Section B.3.31 that the condition-monitoring Inservice Inspection Program - IWL includes no preventive actions.

    The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff finds this program element 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 or Inspected - The “parameters monitored or inspected” program element criterion in SRP-LR Section A.1.2.3.3 are:

> The parameter to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameters monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.3.31 that the program examines primary containment concrete surfaces and concrete surfaces surrounding tendon anchorages for evidence of damage or degradation like concrete cracks. Tendon anchorages and wires are visually examined for cracks, corrosion, and mechanical damage in addition to testing sample wires for yield strength, ultimate tensile strength and elongation. The tendon corrosion protection medium is analyzed for alkalinity, water content, and soluble ion concentration.

The staff concludes that this program element is acceptable on the basis that the applicant inspects primary containment concrete surfaces and concrete surfaces surrounding tendon anchorages for evidence of damage or degradation. In addition, tendon anchorages and wires are visually examined for cracks, corrosion, and mechanical damage in addition to testing sample wires for yield strength, ultimate tensile strength and elongation. Finally, the tendon corrosion protection medium is analyzed for alkalinity, water content, and soluble ion concentration.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects - The “detection of aging effects” program element criteria in SRP-LR Section A.1.2.3.4 are:

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> > Describe when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program)
>
> Link the method for the inspection population and sample size when sampling is used to inspect a group of SCs. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The applicant states in LRA Section B.3.31 that the program inspects containment concrete, tendon end anchorage, and post-tensioning systems at five-year intervals as specified in ASME Code Section XI, Article IWL-2400. The program examines the entire accessible concrete surface and all accessible tendon end anchorage areas during each inspection. Detection methods for aging effects are visual VT-3 examination of all concrete surfaces and a more rigorous VT-1 or VT-1 examination for selected areas (e.g., those indicating suspect conditions and areas surrounding tendon anchorages). Detection of loss of tendon wire prestressing forces is by tendon inspections and analyses in accordance with plant procedures and by surveillance tests. For tendons, the program selects only random samples of each tendon type for examination at each inspection. The minimum number of each type tendon selected varies from 2 to 4 percent. The program measures prestressing forces in sample tendons, detensions one sample tendon of each type, and removes a single wire or strand from each detensioned tendon for examination and testing. These visual examination methods with testing detect aging effects of accessible concrete components and prestressing systems in concrete containments before design-basis requirements are compromised.

The staff concludes that this program element satisfies the criteria defined in SRP-LR Section A.1.2.3.4. The staff finds it acceptable on the basis that the applicant uses a visual VT-3 examination of all containment concrete surfaces and a more rigorous VT-1 or VT-1 examination for selected areas to detect concrete aging effects at five year intervals. In addition, every five years the detection of loss of tendon wire prestressing forces is by tendon inspections and analyses through surveillance tests; with a minimum number of randomly selected tendons of each type being tested. Sample wires are removed from each tendon type for examination and testing also.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - The “monitoring and trending” program element criteria in SRP-LR Section A.1.2.3.5 are:

> Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.
>
> This program element should describe how the data collected is evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

The applicant states in LRA Section B.3.31 that the program compares results to baseline data and other previous test results and monitors, except in inaccessible areas, all concrete surfaces regularly by virtue of examination requirements. Trending of prestressing forces in tendons is in accordance with 10 CFR 50.55a and ASME Code Section XI, Subsection IWL. The program compares prestressing forces in all inspection sample tendons measured by lift-off tests to acceptance standards based on the predicted force for that type of tendon over its life.

The staff concludes that this program element satisfies the criteria defined in SRP-LR Section A.1.2.3.5. The staff finds it acceptable on the basis that the program compares inspection and test results to baseline data and other previous test results and monitors concrete surfaces regularly. Monitoring and trending of prestressing forces in tendons is performed every five years. The prestressing forces in all inspection sample tendons are measured by lift-off tests and compared with acceptance standards based on the predicted force for that type of tendon over its life.

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - The “acceptance criteria” program element criteria in SRP-LR Section A.1.2.3.6 are:

> The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The applicant states in LRA Section B.3.31 that the program compares results to baseline data, other previous test results, and acceptance criteria of the ASME Code Section XI, Subsection IWL, for evaluation of any evidence of degradation. The acceptance criteria are qualitative with guidance provided in Section IWL-2510 and references like American Concrete Institute (ACI) 201.1R and ACI 349.3R for detection of concrete degradation. Predicted tendon forces are calculated in accordance with Subsection IWL and Regulatory Guide 1.35.1, which provides an acceptable methodology for use through the period of extended operation.

The staff concludes that this program element is acceptable on the basis that acceptance criteria is based on a comparison of inservice inspections to baseline data, other previous test (inspection) results, and the acceptance criteria of the ASME Code Section XI, Subsection IWL. Predicted tendon forces are calculated in accordance with Regulatory Guide 1.35.1 for comparison with tendon liftoff force test results.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - The “operating experience” program element criterion in SRP-LR Section A.1.2.3.10 is:

> The operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states in LRA Section B.3.31 that the Inservice Inspection Program - IWL is in accordance with general requirements for engineering programs. Program reviews ensure compliance with regulatory, process, and procedural requirements. The ASME Boiler and Pressure Vessel Code Section XI is a consensus document periodically revised to reflect updated guidance based in part on industry operating experience. Inservice Inspection Program - IWL upgrades are based upon industry and plant-specific operating experience. Additionally, plant-specific operating experiences are shared among the personnel of all three applicant plant sites and corporate offices.

The applicant stated that the program has observed and documented for the containment buildings many cracks which are typical in prestressed and reinforced concrete structures. Some of the cracks are near or exceeding acceptable width thresholds; however, the responsible engineer has determined that all are of no structural significance. Indications of staining, cracking, exposed aggregate and spalling have been identified on the containments and were characterized as minor. No signs of corrosion in the cracks were noted. The spalling was acceptable because the condition had no effect on structural integrity. There was no active degradation noted and the structural integrity of the containment structure was unaffected. The applicant further stated that industry and plant-specific operating experience demonstrate the effectiveness of the program at detecting and managing aging effects so components crediting this program can perform their intended functions consistent with the CLB during the period of extended operation.

During the audit and review, the staff noted that the tendon data for year 2005, as provided in LRA Table 4.5-2, Concrete Containment Tendon Pre-stress, shows that the predicted average tendon force is different for individual Unit 2 inverted U vertical tendons. Also in LRA Table 4.5-4 for year 2005, the predicted average tendon force is different for individual Unit 2 horizontal (shell) hoop tendons. This phenomenon only appears in these two tables for the year 2005. The staff asked the applicant to explain why the predicted average tendon force varies by individual tendon in these two tables for year 2005. In its response, the applicant stated that the predicted average tendon forces in LRA Table 4.5-2 for the individual Unit 2 inverted U vertical tendons are incorrect. The correct values should be 1463 Kips for Tendon Numbers V20-92, V21-91 and V56-130. The predicted average tendon forces in LRA Table 4.5-4 for the individual Unit 2 horizontal (shell) hoop tendons are incorrect. The correct values should be 1427 Kips for Tendon Numbers H-66, H-99 and H-111. These changes do not affect the graphs described in the LRA. The graphs are drawn based on actual data not the predicted data.

In its response, the applicant further stated that the LRA will be amended to correct this discrepancy. The staff confirmed that the applicant revised the LRA in a letter dated February 8, 2008.

The staff finds the applicant’s response acceptable. The values shown in LRA Table 4.5-2 for the individual Unit 2 inverted U vertical tendons and in LRA Table 4.5-4 for the individual Unit 2 horizontal hoop tendons are incorrect and will be corrected by a license renewal application amendment. The correct values have been provided which are more appropriate and agree with the graphs in the LRA.

During the audit and review, the staff reviewed a sample of the operating experience referenced in the basis document for the Inservice Inspection Program – IWL. The staff also reviewed a sample of condition reports. For example, one condition report identified the failure of two vertical tendon wires in one vertical tendon during retensioning on the Unit 1 containment. The two broken wires were removed from the tendon and the tendon was retensioned to an acceptable force based on the reduced number of wires. No further action was identified and the final condition of the tendon was determined to be acceptable.

During audit and review discussions, the staff asked the applicant to discuss the staining, spalling and cracks which were identified on the containment structures and then determined by the responsible engineer to have no structural significance. The applicant stated during the discussions that the staining was very minor and from tendon sheathing grease leakage and not rebars corroding. The applicant further stated that the spalling was not significant and did not threaten the minimum specified concrete cover for rebar and tendon sheathes. The applicant also stated that there were no signs of rebar corrosion at the surface cracks in the containment concrete.

The staff finds the applicant's review and evaluation of the inspection findings for the VEGP containment structures acceptable because all the inspection findings were determined to be minor without any structural significance and not out of the ordinary for concrete structures.

The staff finds that the discussions with the applicant about historic IWL inspection results and review of the operating experience provided in the basis document for the Inservice Inspection Program – IWL did not reveal any unusual or significant findings.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.31, the applicant provided the UFSAR supplement for the Inservice Inspection Program - IWL. 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 - IWL, the staff concludes that the applicant has demonstrated that 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 determined that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.11 Non-EQ Cable Connections One-Time Inspection Program

Summary of Technical Information in the Application LRA Section B.3.36 describes the new Non-EQ Cable Connections One-Time Inspection Program as a plant-specific program.

The Non-EQ Cable Connections One-Time Inspection Program uses one-time inspections on a sample of bolted connections within the scope of license renewal to confirm that loosening of electrical connections is not an aging effect requiring additional aging management during the period of extended operation. The program inspects for loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation.

The factors considered for sample selection are application (medium and low voltage defined as <35kV), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selections will be documented. Inspections may be by thermography, contact resistance testing, or other appropriate methods including visual inspection based on plant configuration and industry guidance.

The applicant identified Commitment No. 27 to be implemented prior to the period of extended operation. If there is an unacceptable condition or situation in the selected sample, the Corrective Action Program will evaluate the condition and determine an appropriate corrective action.

The Non-EQ Cable Connections One-Time Inspection Program adds assurance that electrical cable connections will perform intended function for the period of extended operation. This plant-specific AMP is an alternative to the program described in GALL Report Section XI.E6. The inspections will be within ten years immediately preceding 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.3.36 on the applicant's demonstration of the Non-EQ Cable Connections One-Time 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 Non-EQ Cable Connections One-Time Inspection Program against the staff's recommended program element criteria that are provided in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1. The staff focused its review on assessing how the plant-specific program elements for the Non-EQ Cable Connections One-Time Inspection Program would ensure adequate aging management when compared to the recommended program element criteria that are described in SRP-LR Section A.1.2.3. Specifically, the staff reviewed the following seven (7) program elements of the applicant's program against their corresponding program element criteria that are provided in the subsections to SRP-LR Section A.1.2.3: (1)"scope of the program," (2) "preventive actions," (3) "parameters monitored or inspected," (4) "detection of aging effects," (5) "monitoring and trending," (6) "acceptance criteria," and (10) "operating experience."

The applicant indicated that program elements (7) "corrective actions,"(8) "confirmation process," and (9) "administrative controls" are parts of the site-controlled QA program. The staff evaluated the Inservice Inspection Program's "confirmatory process" and "administrative controls" program elements as part of the staff's evaluation of the applicant's Quality Assurance Program. The staff's evaluation of the applicant's Quality Assurance Program is described in SER Section 3.0.4. The staff's evaluation of the remaining program elements are described in the paragraphs that follow:

(1) Scope of the Program - The “scope of program” program element criterion in SRP-LR Appendix A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

LRA Section B.3.36 states that the scope of this program is defined as the Non-EQ connections for cables within the scope of license renewal. Cable connections connect cable conductors to other cables or electrical devices. Cable connections within the scope of license renewal are in the sample set for this program. Most connections have insulating material and metallic parts. This AMP for electrical cable connections (metallic parts) manages loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. Circuits exposed to appreciable ohmic or ambient heating during operation may experience loosening from repeat cycling of connected loads or cycling of the ambient temperature. Cable connections may loosen if subjected to significant thermally-induced cyclic stress. The design of these connections accounts for the stresses of ohmic heating and thermal cycling; therefore, these stressors should not be a significant aging issue but confirmation of the lack of aging effects is warranted.

The staff interviewed the applicant’s technical personnel and reviewed the Non-EQ Cable Connections One-Time Inspection Program bases documents. The staff concludes that the specific commodity groups for which the program manages aging effects are identified (Non-EQ bolted cable connections associated with cables within the scope of license renewal), which satisfies the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff also determined that the exclusion of high-voltage (>35 kV) switchyard connections, connections covered under EQ program and the existing PM program, acceptable.

Switchyard connections are addressed in SER Section 3.6.2.2. EQ cable connections are covered under 10 CFR 50.49. Cable connections under PM program are periodically inspected. On this basis, the staff finds that the applicant’s scope of program acceptable.

In LRA AMP B.3.36, "Non-EQ Cable Connections One-time Inspection Program," under "Program Description," "and Detection of Aging Effects,” Sections, the applicant states that the inspections will be performed within a window of five years immediately preceding the period of extended operation for the first unit (Unit 1) and in the following paragraph, the applicant states that the inspections will be performed within a window of ten years immediately preceding the period of extended operation. During the audit and review, the staff asked the applicant to clarify when this one-time inspection will be completed for each of the VEGP Units. In its response, the applicant stated that the LRA will be amended to state that the inspections for both units will be performed within a window of five years immediately proceeding the period of extended operation. In its letter dated March 20, 2008, the applicant amended the LRA to correct this discrepancy.

The staff confirmed that the “scope of the program” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions – The “preventive actions” program element criterion in SRP-LR Appendix A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

LRA Section B.3.36 states that the condition-monitoring Non-EQ Cable Connections One-Time Inspection Program takes no actions to prevent or mitigate aging degradation.

The staff concludes that the preventive actions program element satisfies the criterion 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.

The staff confirmed that the “preventive actions” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.2. The staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - The “parameter monitored or inspected” program element criterion in SRP-LR Appendix A.1.2.3.3 are:

The parameter to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameter monitored or inspected should detect the presence and extent of aging effects.

LRA Section B.3.36 states that this program will focus on the metallic parts of cable connections. The one-time inspection verifies that loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an aging effect requiring a periodic AMP. Parameters inspected vary with the detection method.

The staff concludes that the parameters monitored/inspected program element satisfies the criterion 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.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.3. The staff finds this program element acceptable.

(4) Detection of Aging Effects – The “detection of aging effects” program element criteria in SRP-LR Appendix A.1.2.3.4 are:

Provide information that links the parameters to be monitored or inspected to the aging effects being managed.

Describe when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program)

Link the method for the inspection population and sample size when sampling is used to inspect a group of structures and components (SCs). The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

LRA Section B.3.36 states that the program will inspect or test a representative sample of electrical connections within the scope of license renewal and subject to an AMR within five years immediately preceding the period of extended operation of the first unit (VEGP Unit 1) to confirm 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-loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selection will be documented. Inspections may be by thermography, contact resistance testing, or other appropriate methods including visual inspection based on plant configuration and industry guidance. The one-time inspection adds confirmation to support industry operating experience showing that electrical connections have not experienced a high degree of failures and that existing installation and maintenance practices are effective.

During the audit and review, the staff asked the applicant to explain how it would be able to provide an indication of the integrity of the cable connections by visual inspection. In its response, the applicant stated that LRA, Appendix B, Section B.3.36, “detection of aging effects,” to delete visual inspection from the inspection method to verify the integrity of the cable connections.

In its letter dated March 20, 2008, the applicant amended the LRA, Appendix B, Section B.3.36 to state that inspection may include thermography, contact resistance testing, or other appropriate methods.

The staff concludes that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.4. Thermography is used to detect loose connections by monitoring higher than normal temperature 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. The staff also determined 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 the applicant’s detection of aging effects acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.4. The staff finds this program element acceptable.

(5) Monitoring and Trending - The “monitoring and trending” program element criteria in SRP-LR Appendix A Section A.1.2.3.5 are:

Monitoring and trending activities should be described, and they should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions.

This program element should describe how the data collected are evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

LRA Section B.3.36 states that trending actions are not included as parts of this one-time inspection program.

The staff concludes 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.

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.5. The staff finds this program element acceptable.

(6) Acceptance Criteria - Acceptance Criteria - The “acceptance criteria” program element criteria in SRP-LR Appendix A.1.2.3.6 are:

The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The program should include a methodology for analyzing the results against applicable acceptance criteria.

Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site-specific programs. LRA Section B.3.36 states that the acceptance criteria for each inspection or surveillance are defined by the specific inspection or test for the specific type of cable connection. Acceptance criteria selected will indicate loose connection (*e.g.*, higher than normal temperature at the connection, high resistance, observed looseness, etc.)

The staff concludes 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 current licensing basis.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.6. The staff finds this program element acceptable.

(10) Operating Experience - The "operating experience" program element criterion in SRP-LR Appendix A.1.2.3.10 that operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

LRA Section B.3.36 states that the new Non-EQ Cable Connections One-Time Inspection Program has no programmatic history; however, as noted in GALL Report, industry operating experience shows that loosening of connections and corrosion of connections could be problems without proper installation and maintenance. Industry operating experience supports this one-time inspection program in lieu of periodic testing. This one-time inspection program will confirm the effectiveness of installation and maintenance activities. Development of this program considered plant-specific and industry operating experience. Industry operating experience that forms the basis for the program appears in the operating experience element of the GALL Report, Section XI.E6, program description. Plant-specific operating experience is consistent with that program description.

In search of operating experience to respond to 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 very little of the operating experience that related to failed connections due to aging have been identified and this operating experience can 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 PM program is effective such that a periodic inspection program is not required.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement In LRA Section A.2.36, the applicant provided the UFSAR supplement for the Non-EQ Cable Connections One-Time Inspection Program. The staff reviewed the applicant's license renewal commitment list in a letter dated February 08, 2008, and confirmed that this new program is identified as Commitment No. 27 to be implemented for both units within a window of five years immediately proceeding the period of extended operation.

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 Non-EQ Cable Connections One-Time Inspection Program, the staff concludes that the applicant has demonstrated that 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 determined that it provides an 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

3.0.4.1 *Summary of Technical Information in Application*

In Sections A.2.0, "Aging Management Programs," and B.1.3, "Aging Management Program Quality Control Attributes," of the license renewal application (LRA), the applicant described the elements of corrective action, confirmation process, and administrative controls that are applied to the aging management programs (AMPs) for both safety-related (SR) and nonsafety-related components. The VEGP quality assurance program (QAP) 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 QAP regardless of the safety classification of the components. Specifically, in Section A.2.0 and Section B.1.3, respectively, the applicant stated that the QAP implements the requirements of 10 CFR 50, Appendix B, and is consistent with NUREG-1801, "Generic Aging Lessons Learned (GALL) Report."

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 structure and components (SCs) subject to an aging management review (AMR) will be adequately managed so that their intended functions will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. The SRP-LR, Branch Technical Position 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 controls. Table A.1-1, "Elements of an Aging Management Program for license Renewal," of Branch Technical Position RLSB-1 provides the following description of these quality attributes:

- Attribute No. 7 - Corrective Actions, including root cause determination and prevention of recurrence, should be timely;

- Attribute No. 8 - Confirmation Process, which should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective; and,

- Attribute No. 9 - Administrative Controls, which should provide a formal review and approval process.

The SRP-LR, Branch Technical Position IQMB-1 noted that those aspects of the AMP that affect quality of safety-related structures, systems and components (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 QAP may be used to address the elements of corrective action, confirmation process, and administrative control. Branch Technical Position 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 supplement in accordance with 10 CFR 54.21(d)."

The NRC staff reviewed the applicant's AMPs described in Appendix A, "Final Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs and Activities," of the LRA, and the associated implementing documents. The purpose of this review was to ensure that the QA attributes (corrective action, confirmation process, and administrative controls) were consistent with the staff's guidance described in the SRP-LR, Section A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)." Based on the NRC staff's evaluation, the descriptions of the AMPs and their associated quality attributes provided in Appendix A, Section A.2.0, and Appendix B, Section B.1.3, of the LRA are consistent with the staff's position regarding QA for aging management.

3.0.4.3 *Conclusion*

On the basis of the NRC staff's evaluation, the descriptions and applicability of the plant-specific AMPs and their associated quality attributes provided in Appendix A, Section A.2.0, and Appendix B, Section B.1.3 of the LRA, were determined to be 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 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
- RCS and connected lines (includes the reactor coolant pumps)
- pressurizer
- SGs

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 RCS components and component groups. LRA Table 3.1.1, "Summary of Aging Management Evaluations for Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System in Chapter IV of NUREG-1801," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the reactor vessel, reactor vessel internals, and RCS 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 RCS 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 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 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 3.1.2.2 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 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.

Table 3.1-1 summarizes the staff's evaluation of components, aging effects or 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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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)	Yes	Not applicable	Not applicable to VEGP (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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor coolant pressure boundary 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	Yes	Not applicable	Not applicable to PWRs (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	Yes	Not applicable	Not applicable to PWRs (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)	Yes	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel Alloy tubes and sleeves in a reactor coolant and secondary feedwater/steam environment (3.1.1-6)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel and stainless steel reactor coolant pressure boundary closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting (3.1.1-7)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel; stainless steel; and nickel-alloy reactor coolant pressure boundary piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves (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	Yes	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; 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	Yes	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or RCIC, 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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2)
Steel steam generator shell assembly exposed to secondary feedwater and steam (3.1.1-12)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to VEGP.(See SER Section 3.1.2.2.2)
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	Yes	Not applicable	Not applicable to PWRs (See SER Section 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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant (3.1.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2)
Steel steam generator upper and lower shell and transition cone exposed to secondary feedwater 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.	Yes	Water Chemistry Control Program (B.3.28) and Inservice Inspection Program (B.3.13)	Inservice Inspection Program is a plant-specific program (See SER Section 3.1.2.2.2.4)
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 10 CFR 50, Appendix G, and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	Yes	TLAA	Loss of fracture toughness is a TLAA (See SER Section 3.1.2.2.3.1)
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	Yes	Reactor Vessel Surveillance Program (B.3.25)	Consistent with the GALL Report with exception (See SER Section 3.1.2.2.3.2)
Stainless steel and nickel alloy top head enclosure vessel flange leak detection line (3.1.1-19)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel isolation condenser components exposed to reactor coolant (3.1.1-20)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Yes	Not applicable	Not applicable to PWRs (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	Yes	Not applicable	Not applicable to VEGP.(See SER Section 3.1.2.2.5)
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.	Yes	Reactor Vessel Internals Program (B.3.24)	Consistent with the GALL Report (See SER Section 3.1.2.2.6)
Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (3.1.1-23)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes	Water Chemistry Control Program (B.3.28) and Inservice Inspection Program (B.3.13)	Consistent with the GALL Report (See SER Section 3.1.2.2.7.1)
Class 1 cast austenitic stainless steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-24)	Cracking due to stress corrosion cracking	Water Chemistry and, for CASS components that do not meet the NUREG-0313 guidelines, a plant specific AMP	Yes	Water Chemistry Control Program (B.3.28) and Inservice Inspection Program (B.3.13)	Consistent with the GALL Report (See SER Section 3.1.2.2.7.2)
Stainless steel jet pump sensing line (3.1.1-25)	Cracking due to cyclic loading	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	Yes	Not applicable	Not applicable to PWRs (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.	Yes	Reactor Vessel Internals Program (B.3.24)	Consistent with the GALL Report (See SER Section 3.1.2.2.9)
Steel steam generator feedwater impingement plate and support exposed to secondary feedwater (3.1.1-28)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.2.10)
Stainless steel steam dryers exposed to reactor coolant (3.1.1-29)	Cracking due to flow-induced vibration	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.11)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube (CRGT) assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures) (3.1.1-30)	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and UFSAR 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.	Yes	Reactor Vessel Internals Program (B.3.24) and Water Chemistry Control Program (B.3.28)	Consistent with the GALL Report (See SER Section 3.1.2.2.12)
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 UFSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	Yes	Water Chemistry Control Program (B.3.28), Inservice Inspection Program (B.3.13), and Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations (B.3.14) or Reactor Vessel Internals Program (B.3.24)	Partially Consistent with the GALL Report (See SER Section 3.1.2.2.13)
Steel steam generator feedwater inlet ring and supports (3.1.1-32)	Wall thinning due to flow-accelerated corrosion	A plant-specific aging management program is to be evaluated.	Yes	Steam Generator Program for Upper Internals (B.3.27)	Consistent with the GALL Report (See SER Section 3.1.2.2.14)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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.	Yes	Reactor Vessel Internals Program (B.3.24)	Consistent with the GALL Report (See SER Section 3.1.2.2.15)
Stainless steel and nickel alloy reactor control rod drive head penetration pressure housings (3.1.1-34)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	Yes	Water Chemistry Control Program (B.3.28) and Inservice Inspection Program (B.3.13)	Partially Consistent with the GALL Report (See SER Section 3.1.2.2.16)
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 stress corrosion cracking 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 UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.2.16)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Nickel alloy, stainless steel pressurizer spray head (3.1.1-36)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.2.16)
Stainless steel and nickel alloy reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Lower internal assembly, CEA shroud assemblies, Core shroud assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly) (3.1.1-37)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and UFSAR 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.	Yes	Water Chemistry Control Program (B.3.28) and Reactor Vessel Internals Program (B.3.24)	Consistent with the GALL Report (See SER Section 3.1.2.2.17)
Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant (3.1.1-38)	Cracking due to cyclic loading	BWR Control Rod Drive Return Line Nozzle	No	Not applicable	Not applicable to PWRs
Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant (3.1.1-39)	Cracking due to cyclic loading	BWR Feedwater Nozzle	No	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy penetrations for control rod drive 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 stress corrosion cracking, Intergranular stress corrosion cracking, cyclic loading	BWR Penetrations and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds (3.1.1-41)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant (3.1.1-42)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel ID Attachment Welds and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant (3.1.1-43)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, core spray lines, spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes (3.1.1-44)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR Vessel Internals and Water Chemistry	No	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	No	Not applicable	Not applicable to PWRs
Nickel alloy core shroud and core plate access hole cover (mechanical covers) (3.1.1-46)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not applicable	Not applicable to PWRs
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	No	Not applicable	Not applicable to PWRs
Steel and stainless steel Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-48)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (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	No	Not applicable	Not applicable to PWRs
Nickel alloy core shroud and core plate access hole cover (welded covers) (3.1.1-49)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, 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	No	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 stress corrosion cracking and intergranular stress corrosion cracking	Reactor Head Closure Studs	No	Not applicable	Not applicable to PWRs
Cast austenitic stainless steel 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	No	Not applicable	Not applicable to PWRs
Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems (3.1.1-52)	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.1.2.1.2)
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Cast austenitic stainless steel 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.	No	Inservice Inspection Program (B.3.13)	Consistent with the GALL Report (See SER Section 3.1.2.1.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy > 15% 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	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive 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	No	RCS CASS Fitting Evaluation Program (B.3.5)	Consistent with the GALL Report
Steel reactor coolant pressure boundary external surfaces exposed to air with borated water leakage (3.1.1-58)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion Control Program (B.3.3)	Consistent with the GALL Report (See SER Sections 3.1.2.1.1 and 3.1.2.1.4)
Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/steam (3.1.1-59)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Flow Accelerated Corrosion Program (B.3.10)	Consistent with the GALL Report
Stainless steel flux thimble tubes (with or without chrome plating) (3.1.1-60)	Loss of material due to wear	Flux Thimble Tube Inspection	No	Flux Thimble Tube Inspection Program (B.3.11)	Consistent with the GALL Report
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)	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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)	No	Fatigue and Cycle Monitoring Program (B.3.38) and the Inservice Inspection Program (B.3.13)	Not consistent with the GALL Report (See SER Section 3.1.2.1.5)
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)	No	Inservice Inspection Program (B.3.13) or Reactor Vessel Internals Program (B.3.24)	Partially consistent with the GALL Report (See SER Section 3.1.2.1.6)
Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components (3.1.1-64)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	No	Water Chemistry Control Program (B.3.28) and Inservice Inspection Program (B.3.13)	Consistent with the GALL Report (See SER Section 3.1.2.1.7)
Nickel alloy reactor vessel upper head and control rod drive 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	No	Water Chemistry Control Program (B.3.28), Inservice Inspection Program (B.3.13), and Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations (B.3.15)	Consistent with the GALL Report (See SER Section 3.1.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
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	No	Fatigue and Cycle Monitoring Program (B.3.38) and Inservice Inspection Program (B.3.13)	Not consistent with the GALL Report (See SER Section 3.1.2.1.5)
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 stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Inservice Inspection Program (B.3.13) and Water Chemistry Control Program (B.3.28)	Partially consistent with the GALL Report (See SER Section 3.1.2.1.7)
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 stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Inservice Inspection Program (B.3.13) and Water Chemistry Control Program (B.3.28)	Partially consistent with the GALL Report (See SER Section 3.1.2.1.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel; steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-70)	Cracking due to stress corrosion cracking, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	Inservice Inspection Program (B.3.13), Fatigue and Cycle Monitoring Program (B.3.38), and Water Chemistry Control Program (B.3.28)	Partially consistent with the GALL Report (See SER Section 3.1.2.1.9)
High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage (3.1.1-71)	Cracking due to stress corrosion cracking; loss of material due to wear	Reactor Head Closure Studs	No	Reactor Vessel Closure Stud Program (B.3.23)	Consistent with the GALL Report
Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater/steam (3.1.1-72)	Cracking due to OD stress corrosion cracking and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	No	Water Chemistry Control Program (B.3.28) and Steam Generator Tubing Integrity Program (B.3.26)	Consistent with the GALL Report (See SER Section 3.1.2.1.6)
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	No	Water Chemistry Control Program (B.3.28) and Steam Generator Tubing Integrity Program (B.3.26).	Consistent with the GALL Report
Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary feedwater/steam (3.1.1-74)	Cracking due to stress corrosion cracking, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	No	Water Chemistry Control Program (B.3.28) and Steam Generator Tubing Integrity Program (B.3.26)	Consistent with the GALL Report (See SER Sections 3.1.2.1.6 and 3.1.2.1.7)
Nickel alloy once-through steam generator tubes exposed to secondary feedwater/steam (3.1.1-75)	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel steam generator tube support plate, tube bundle wrapper exposed to secondary feedwater/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	No	Water Chemistry Control Program (B.3.28) and Steam Generator Tubing Integrity Program (B.3.26)	Consistent with the GALL Report (See SER Section 3.1.2.1.10)
Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater/steam (3.1.1-77)	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Steel steam generator tube support lattice bars exposed to secondary feedwater/steam (3.1.1-78)	Wall thinning due to flow-accelerated corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Nickel alloy steam generator tubes exposed to secondary feedwater/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 NRC Bulletin 88-02.	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Cast austenitic stainless steel reactor vessel internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly) (3.1.1-80)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Reactor Vessel Internals Program (B.3.24)	Not consistent with the GALL Report (See SER Section 3.1.2.1.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Water Chemistry Control Program (B.3.28)	Consistent with the GALL Report
Stainless steel steam generator primary side divider plate exposed to reactor coolant (3.1.1-82)	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor vessel internals and reactor coolant pressure boundary components exposed to reactor coolant (3.1.1-83)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry Control Program (B.3.28) and Steam Generator Tube Integrity Program (B.3.26)	Consistent with the GALL Report
Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater/steam (3.1.1-84)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)
Nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.1.1-85)	None	None	No	None	Consistent with the GALL Report
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	No	None	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel piping, piping components, and piping elements in concrete (3.1.1-87)	None	None	No	Not applicable	Not applicable to VEGP (See SER Section 3.1.2.1.1)

The staff's review of the reactor vessel, reactor vessel internals, and RCS 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 RCS components is documented in SER Section 3.0.3.

3.1.2.1 AMR Results Consistent with the GALL Report

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 RCS components:

- ACCW System Carbon Steel Components Program
- Bolting Integrity Program
- Boric Acid Corrosion Control Program
- CASS RCS Fitting Evaluation Program
- Closed Cooling Water Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Flux Thimble Tube Inspection Program
- Inservice Inspection Program
- Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations

- Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations
- Oil Analysis Program
- One-Time Inspection Program
- One-Time Inspection Program for ASME Code Class 1 Small Bore Piping
- Reactor Vessel Closure Head Stud Program
- Reactor Vessel Internals Program
- Reactor Vessel Surveillance Program
- Steam Generator Tubing Integrity Program
- Steam Generator Program for Upper Internals
- Water Chemistry Control Program
- Fatigue Monitoring Program

LRA Tables 3.1.2-1 through 3.1.2-5 summarize AMRs for the reactor vessel, reactor vessel internals, and RCS 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.

For each AMR line item the applicant noted 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 Report 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 Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 Report 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 determined 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 Report 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 Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 or NUREG-1801 identifies a plant specific aging management program. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report 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.

3.1.2.1.1 AMR Results Identified as Not Applicable

All or some of the AMR line items in the GALL Report Volume 2 that corresponds to GALL Report Table 1, items 10, 12, 35, 59, 66, 75, 84 are not applicable to the recirculating steam generators. The applicant stated in the LRA that the VEGP steam generators are a Westinghouse Model F recirculating design. The GALL Report aging management item associated with these line items is applicable only to once through steam generators. The staff reviewed the documentation supporting the applicant's AMR evaluations and confirmed the applicant's statement that VEGP does not have once-through steam generators. On the basis that VEGP does not have once-through steam generators, the staff agrees with the applicant's determination that the GALL Report AMR items associated with the once-through steam generators are not applicable for VEGP.

The discussion in LRA Table 3.1.1 Item54 states that this item is not applicable, since VEGP reactor coolant system boundary does not include any copper alloy components exposed to closed-cycle cooling water. During the audit and review, the staff noted that the GALL Report Item IV.C2-11, that rolls up to the GALL Report Table 1, Item 54, identifies loss of material due to pitting, crevice, and galvanic corrosion as an aging effect for copper alloy piping, piping components, and piping elements in closed cycle cooling water environment. During the audit and review, the staff reviewed the applicant's license renewal Program basis document for the steam generator component groups and verified that VEGP does not have any copper alloy component exposed to closed-cycle cooling water in the reactor coolant system. On this basis, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

The discussion in LRA Table 3.1.1, Item 56 states that this item is not applicable, since VEGP reactor coolant system boundary does not include any copper alloy component with > 15% Zn. The staff noted that the GALL Report Item IV.C2-12, that rolls up to the GALL Report Table 1, Item 56, identifies loss of material due selective leaching for copper alloy piping components with >15% Zn. During the audit and review, the staff reviewed the applicant's license renewal Program basis document for the reactor coolant system and connected line component groups and verified that VEGP does not have any copper alloy component exposed to closed-cycle cooling water in the reactor coolant system. On this basis, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

The discussion in LRA Table 3.1.1, Item 61, states that the VEGP pressurizer support skirt and flange is not subject to cracking due to cyclic loading. The staff noted that the GALL Report Item IV.C2-16, that rolls up to the GALL Report Table 1, Item 61, identifies cracking due to cyclic loading for pressurizer integral support fabricated from steel or stainless steel and exposed to air with metal temperature up to 288°C (550°F). During the audit and review, the staff asked the applicant to provide technical justification for not identifying cracking due to cyclic loading for VEGP pressurizer support skirt.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that UFSAR Section 3.9.N 1 describes the design transients, loads, and analysis methods used to ensure the adequacy of the RCS component supports, which include the pressurizer support skirt and flange. SNC's review determined these analyses remain valid for the extended period of operation, but are not TLAAs. The applicant further stated that for the pressurizer support loads are applied gradually and remain constant and dynamic loads are too infrequent to initiate fatigue cracking. Therefore, cracking due to thermal fatigue is not an aging effect requiring further evaluation for these structural components. The staff reviewed the applicant's license renewal Program basis document for the pressurizer component groups. The staff also reviewed the VEGP UFSAR Section 3.9.N.1.4.4, "Primary Component Supports Models and Methods" and Section 3.9.N.1.4.8, "Stress Criteria for Class 1 Components and Component Supports." On the basis of these reviews, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

The discussion in LRA Table 3.1.1, Item 77, states that this item is not applicable. VEGP does not use phosphate chemistry. On the basis that the staff verified that VEGP does not use phosphate chemistry in its feedwater/steam environment, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

The discussion in LRA Table 3.1.1, Item 79, states that The VEGP steam generator tube support plates are fabricated from type 405 ferritic stainless steel. The staff noted that the

GALL Report Item IV.D-19, that rolls up to the GALL Report Table 1, Item 79, identifies denting/ corrosion of carbon steel tube support plate for nickel alloy steam generator tubes. During the audit and review, the staff reviewed VEGP UFSAR Section 5.4.2.4.2, “Steam Generator Design Effects on Materials,” and verified that the tube support plates are made of type 405 ferritic stainless steel. In addition this section of UFSAR states that the peripheral supports provide stability to the plates so that tube fretting or wear due to flow induced plate vibrations at the tube support contact regions is minimized. On this basis, the staff agrees with the applicant’s determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

The discussion in LRA Table 3.1.1, Item 82, states that the VEGP steam generator divider plates are fabricated from nickel alloys, not stainless steel. On the basis that VEGP does not use stainless steel as a material of construction for its steam generator primary side divider plate, the staff agrees with the applicant’s determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

During the audit and review, the staff noted that GALL Report Table 1, Item 86, lists stainless steel piping, piping components, and piping elements externally exposed to uncontrolled indoor air, air with borated water leakage, and concrete or gas. GALL Report items IV.E-2, IV.E-3, IV.E-4, and IV.E-5 roll up to this table 1 Item 86. LRA Table 3.1.1, line-item 3.1.1-86, in the discussion column, states that this line-item is consistent with the GALL Report. However, LRA Table 3.1.2-1 through Table 3.1-2-5 does not include stainless components exposed to air with borated water leakage (IV.E-3), concrete (IV.E-4), or gas (IV.E-5). During the audit and review, the staff asked the applicant to clarify whether these line-items are not applicable to VEGP.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that exposure of stainless steel surfaces to borated water leakage is applicable for VEGP and that VEGP LRA Tables 3.1.2-1, 3.1.2-2, 3.1.2-3, 3.1.2-4, and 3.1.2-5 do not include separate items for exposure to borated water leakage. The applicant stated that, regardless of these facts, the VEGP AMR results are consistent with the GALL Report Item IV.E-4 and conclude that there are no aging effects requiring management for stainless steel component external surfaces, even when exposed to borated water leakage. The staff agreed with the applicant that, consistent with the GALL Report Item IV.E-4, the external surfaces of the reactor coolant system components that are fabricated from stainless steel do not have any aging effects that need to be managed during the extended period of operation. Therefore, the staff finds this portion of the applicant’s response acceptable.

In its response, the applicant also stated that the VEGP reactor coolant system and connect lines interface with concrete at wall penetrations and that VEGP AMR methodology does not generate separate AMR line items to address the concrete environment for piping penetrations. The applicant stated that, for these cases, the environment associated with pipe penetrations is considered to be a part of the indoor air environment, but regardless of this fact, the VEGP AMR results are consistent with NUREG-1801 Item IV.E-4 and conclude that there are no aging effects requiring management for stainless steel components embedded in concrete. During the audit and review, the staff verified that the VEGP reactor coolant system does not include any stainless steel components that are embedded in concrete. Therefore, the staff finds this portion of the applicant’s response acceptable.

Regarding exposure to a dried gas, the applicant stated that VEGP does not include an ASME Class 1 piping component associated with the reactor coolant system and connect lines that are exposed to a dried gas. However this system includes non-ASME Class 1 piping component in a dried gas environment. For these components, the LRA AMR line items are linked to the GALL Report Item VII.J-19, which is associated with non-ASME Class 1 mechanical auxiliary systems. The staff agreed with the applicant that this match more appropriately describes the component type, since Section IV of the GALL Report is focused on ASME Class 1 components. Therefore, the staff finds this portion of the applicant's response acceptable.

The discussion in LRA Table 3.1.1, Item 87, states this line item is not applicable to VEGP. VEGP has no in-scope reactor vessel, internals, and reactor coolant system components embedded in concrete. On the basis that the staff verified that VEGP does not have any reactor coolant system components embedded in concrete, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable for VEGP.

3.1.2.1.2 Cracking Due to SCC, Loss of Material Due to Wear, and Loss of Preload

During the audit and review the staff noted that the discussion in LRA Table 3.1.1, Item 52, states that VEGP manages reactor coolant pressure boundary bolting cracking, loss of material, and loss of preload with the plant-specific Bolting Integrity Program. LRA Tables 3.1.2-1, 3.1.2-3, 3.1.2-4, and 3.1.2-5 uses a standard Note E for the AMR line items that roll up to the LRA Table 3.1.1, Item 52. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Section IV lists reactor coolant system components, which roll up to GALL Report Table 1, Item 52, that identify cracking due SCC, loss of material due wear, and loss of preload as aging effects for steel closure bolting in air with reactor coolant leakage environment. The GALL Report recommends GALL AMP XI.M18, "Bolting Integrity" for managing these aging effects while the LRA uses the Bolting Integrity Program, which is a plant specific program. The staff reviewed the applicant's Bolting Integrity Program, and the staff's evaluation is documented in SER Section 3.0.3.3.2. The staff's review of the Bolting Integrity Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). During the audit and review, the staff agreed with the applicant's determination that these LRA line items are consistent with the GALL Report, except that the Bolting Integrity Program is identified as a plant specific AMP for the Votgle LRA. On the basis of the staff's evaluation of the AMP and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

3.1.2.1.3 Loss of Fracture Toughness Due to Thermal Aging Embrittlement

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 55, states that the VEGP Inservice Inspection Program manages loss of fracture toughness due to thermal embrittlement of the VEGP reactor coolant pump casings and reactor coolant system valve bodies. LRA Table 3.1.2-3 uses a standard Note E for the AMR line items that roll up to the LRA Table 3.1.1, Item 55. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or GALL Report identifies a plant-specific aging management program. GALL Report Item IV.C2-6, which rolls up to GALL Report Table 1 Item 55, identifies loss of fracture toughness due to thermal aging embrittlement as aging effects for CASS Class 1 pump casings, and valve bodies and bonnets in borated water. The GALL Report recommends GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," for Class 1 components" for managing this aging effect while the LRA uses the Inservice Inspection Program, which is a plant specific program. The staff reviewed the applicant's Inservice Inspection Program, and the staff's evaluation is documented in SER Section 3.0.3.3.4. The staff agreed with the applicant's determination that these LRA line items are consistent with the GALL Report, except that the Inservice Inspection Program is identified as a plant specific AMP for the VEGP LRA. The staff's review of the Inservice Inspection Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the basis of the staff's evaluation of the AMP and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

In LRA Table 3.1.1, line-Item 3.1.1-80, in the discussion column, the applicant of states that the bottom mounted instrumentation column cruciforms are the only austenitic stainless steel castings used in the VEGP reactor vessel internals. For these castings, VEGP will manage loss of fracture toughness due to thermal aging and neutron irradiation embrittlement with the LRA B.3.24 AMP, Reactor Vessel Internals Program (RVI). However, the staff noted that GALL Report Table 1, line-Item 80, recommends using Thermal Aging Neutron Irradiation Embrittlement of CASS Program for managing loss of fracture toughness due to thermal aging and neutron irradiation embrittlement. During the audit and review, the staff asked the applicant to provide technical justification for using RVI in lieu of the GALL Report recommended program and discuss in detail the MRP activities that refer or include loss of fracture toughness due to thermal aging and neutron irradiation embrittlement for the reactor internals.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the VEGP Bottom Mounted Instrumentation Column Cruciforms are CF8 cast austenitic stainless steel and are conservatively screened in for thermal aging, since details of the ferrite and molybdenum content associated with each casting are not known and that the cruciform castings are projected to exceed both the 10^{17} n/cm^2 (E > 1MeV) fluence threshold referenced in the GALL AMP XI.M13. The applicant stated that, as a result of this determination, the cruciform castings "screen in" for irradiation embrittlement. The applicant stated that the aging management strategy relies on the results of the ongoing EPRI Materials Reliability Program initiative to develop a comprehensive aging management program for PWR reactor internals, and that as such, the VEGP Reactor Vessel Internals Program includes a commitment to submit an inspection plan for staff review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

The staff reviewed the applicant's Reactor Vessel Internals Program, and the staff's evaluation is documented in SER Section 3.0.3.3.7. During the audit and review, the staff confirmed that the applicant's Commitment 20 of its letter dated June 27, 2007, stated that it will implement the Reactor Vessel Internals Program. The commitment has been added to Appendix A of this SER. The program is described in LRA Section A.2.24 and Section B.3.24 and is based on the following commitments: (1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. On the basis of the staff's evaluation of the AMP and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

3.1.2.1.4 Loss of Material Due to Boric Acid Corrosion

During the audit and review, the staff noted that LRA Table 3.1.2-3, Item 20g, credits LRA AMP B.3.8, External Surfaces Monitoring Program, for managing loss of material for carbon steel valve bodies exposed to indoor air. LRA claims consistency with the GALL Report VII.I-8 and GALL Table 1, Item 3.1.1-58. However, GALL Report VII.I-8, and GALL Table 1, Item 3.1.1-58, are not consistent. Item VII.I-8 recommends using External Surfaces Monitoring Program, but Item 3.1.1-58 recommends using Boric Acid Corrosion Program. During the audit and review, the staff asked the applicant to clarify this discrepancy and to provide technical justification for using the External Surfaces Monitoring Program. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that LRA Table 3.1.2-3, Item 20g, should have been linked with GALL Report Table 1, Item 3.3.1-58, instead of Item 3.1.1-58 and that GALL Report Item 3.3.1-58 recommends using the External Surfaces Monitoring Program for managing loss of material for steel external surfaces exposed to indoor air, which matches the material, environment and program combination shown in LRA Table 3.1.2-3 (Item 20g). The applicant further stated that this is also consistent with GALL Report VII.I-8 and that the External Surfaces Monitoring Program will visually identify loss of material due to general corrosion, such as on the external surfaces of these carbon steel valves. The applicant stated that the valve bodies addressed by Item 20g are not ASME Class 1 components but rather non-ASME Class 1 components associated with RCS support systems (e.g. oil spill protection, cooling water). The staff finds the applicant response acceptable since it stated that the applicant will revise the LRA to correct the above typographical error. The staff confirmed that the applicant revised the LRA in a letter dated March 20, 2008.

3.1.2.1.5 Cracking Due to Cyclic Loading

During the audit and review, the staff noted that LRA Table 3.1.2-3, Item 9a, credits Fatigue Monitoring Program and Inservice Inspection Program for managing cracking due to cyclic loading for stainless steel Class 1 piping components ≥NPS 4 that are exposed to borated water. LRA claims consistency with the GALL Report IV.C2-26 that rolls up to the GALL Table 1 line 62. GALL Report Item IV.C2-26 recommends using Inservice Inspection Program for managing cracking due to cyclic loading. LRA uses a standard Note E and a plant special Note 105 for this line-item. Note E means that this line-Item is consistent with GALL Report for material, environment, and aging effect, but a different aging management program is credited. Note 105 states that the associated GALL Report Vol. 2 item does not include all of the piping lines applicable for VEGP. Stress based fatigue monitoring to manage thermal fatigue is performed by the Fatigue and Cycle Monitoring Program for a number of VEGP ASME Class 1 piping locations." During the audit and review, the staff asked the applicant to clarify whether the aging effect "cracking due to cyclic loading" already postulates the initiation of a fatigue-induced crack in these piping components and provide justification on how the Fatigue Monitoring Program manages cracking due to cyclic loading in these components when the program does not perform any inspections of the components surfaces. The staff also asked the applicant to discuss the inspection methods or techniques and frequency of these inspections that are being used to detect, monitor/trend cracking due cyclic loading.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that, as discussed in Section 3.1.2.2.1 of this document, the applicant will revise LRA Table 3.1.2-3, Item 9a, to refer to the GALL Report Item IV.C2-25 that rolls up to Table 1 line 8 instead of GALL Report Item IV.C2-26 which rolls up to Table 1, line 62. Table 1, Item 62, will not be used by VEGP. The applicant also stated that the revised LRA will be amended to replace "cracking due to cyclic loading" with the term "Cracking - Thermal Fatigue," because SNC does not postulate the pre-existence of a fatigue-induced crack. The applicant further stated that component inspections are not performed by the Fatigue Monitoring Program and that instead, the program tracks the number of cycle associated with the plant's design basis transients in order to monitor for its impact on the CUF values for these components and to manage cracking due to thermal fatigue. The staff finds the applicant response acceptable since it provided clarification that VEGP does not postulate a fatigue-induced crack for stainless steel Class 1 piping components ≥ NPS 4 that are exposed to borated water. The staff confirmed that the applicant revised the LRA in a letter dated March 20, 2008.

During the audit and review, the staff noted that LRA Table 3.1.2-4, items 2b, 3b, 4b, 6b, 7b, 9a, 10a, and 11a, credit Fatigue Monitoring Program and Inservice Inspection Program for managing cracking due to cyclic loading for pressurizer components fabricated of stainless steel, steel with stainless steel cladding, or nickel alloy materials that are exposed to borated water. LRA uses a standard Note E which means that this line-item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. LRA claims consistency with the GALL Report line-Item IV.C2-18 that rolls up to the GALL Table 1, line 67. GALL Report Item IV.C2-18 recommends the Inservice Inspection Program and Water Chemistry Control Program for managing this aging effect. The applicant in the discussion column of LRA Table 3.1.1,line Item 67, states that the Water Chemistry Control Program is not credited to mitigate cracking due to cyclic loading. During the audit and review, the staff asked the applicant to clarify whether the aging effect "cracking due to cyclic loading" already postulates the initiation of a fatigue-induced crack in these pressurizer components and to justify how the Fatigue Monitoring Program manages cracking due to cyclic loading in these components when the program does not credit any inspections of the components surfaces. The staff also asked the applicant to discuss the inspection methods or techniques and frequency of these inspections that are being used to detect, monitor/trend cracking due cyclic loading.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that, as discussed in Section 3.1.2.2.1 of this document, the applicant will amend LRA Table 3.1.2-4, items 2b, 3b, 4b, 6b, 7b, 9a, 10a, and 11a to refer to the GALL Report Item IV.C2-25 that rolls up to Table 1 line 8 instead of GALL Report Item IV.C2-18 which rolls up to Table 1 line 67. The applicant stated that Table 1, Item 67, will not be used by VEGP. The applicant also stated that it will amend these AMRs to replace the term "cracking due to cyclic loading" with the term "Cracking - Thermal Fatigue," because SNC does not postulate the pre-existence of a fatigue-induced crack. The applicant also stated that component inspections are not performed by the Fatigue Monitoring Program and that instead, the program tracks the number of cycles associated with the plant's design basis transients in order to monitor for its impact on the CUFs of these components and manage cracking due to thermal fatigue. The staff finds the applicant response acceptable since it provided clarification that VEGP does not postulate the existence of a fatigue-induced crack for stainless steel Class 1 piping components that are exposed to borated water. The staff confirmed that the applicant amended the LRA appropriately in a letter dated March 20, 2008.

3.1.2.1.6 Loss of Material Due to Wear

During the audit and review, the staff noted that LRA Table 3.1.2-2 items 5e, 6e, 7e, 9c, 10c, 12e, 13e, 17e, 19e, and 20e identify loss of material due to wear for stainless steel components in borated water environment. LRA uses Reactor Vessel Internals Program for managing this aging effect. It claims consistency with the GALL Report items IV.B2-26 and IV.B2-34, which roll up to GALL Table 1, Item 63. It uses a standard Note E, which means that this line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited. GALL Report items IV.B2-26 and IV.B2-34 recommend ISI program for managing this aging effect. During the audit and review, the staff asked the applicant to provide technical justification for using the RVI program in lieu of the ISI program.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that wear of most reactor internals components is expected to be adequately managed by ISI Program inspections but stated that supplemental augmented inspections will be performed on these components if the EPRI MRP inspection and flaw evaluation guidelines for PWR reactor internals conclude that augmented inspections would be needed to manage wear in some of the reactor internals. The applicant stated that SNC is not proposing alternatives to ASME Section XI examination requirements for reactor internals under the Reactor Vessel Internals Program. Instead, the applicant stated that SNC is addressing the possibility of additional inspection requirements for some component locations and that the VEGP reactor vessel internals inspection plan will identify the inspection requirements for the reactor vessel internals components. The applicant stated that the inspection plan will rely on ISI Program inspections and identify any additional/augmented inspections to be performed. During the audit and review, the staff concludes that the use of the Reactor Vessel Internals Program in lieu of the Inservice Inspection Program is acceptable, because the Reactor Vessel Internals will perform those additional/ augmented inspections to the ASME Section XI inspection requirements that are recommended through the industry initiatives of the EPRI MRP, and because the applicant has addressed this in LRA Commitment No. 20, which was submitted in the applicant's letter of March 20, 2008. On this basis, the staff finds the applicant's response acceptable.

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 63, states that VEGP manages wear of the reactor vessel flange and reactor vessel closure head flange with the Inservice Inspection Program. LRA Tables 3.1.2-1 uses a standard Note E for the AMR line items 4b and 25b that roll up to the LRA Table 3.1.1, Item 63. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Item IV.A2-25, which rolls up to GALL Report Table 1, Item 63, identifies loss of material due to wear as an aging effect for steel vessel shell flange in reactor coolant environment. The GALL Report recommends GALL AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components” for managing this aging effect while the LRA uses the Inservice Inspection Program, which is a plant specific program. The staff reviewed the applicant’s Inservice Inspection Program, and the staff’s evaluation is documented in SER Section 3.0.3.3.4. The staff agreed with the applicant’s determination that these LRA line items are consistent with the GALL Report, except that the Inservice Inspection Program is identified as a plant specific AMP for the Votgle LRA. The staff’s review of the Inservice Inspection Program includes the staff’s assessment of the AMP’s program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the basis of the staff’s evaluation of the AMP and the staff’s determination that the applicant’s AMR results are consistent with the GALL Report, the staff finds the applicant’s AMR results to be acceptable.

During the audit and review, the staff noted that the LRA Table 3.1.2-5, Item 30e,credits Steam Generator Tubing Integrity Program for managing loss of material due to wear for nickel alloy steam generator tubes exposed to treated water. LRA shows consistency with GALL Report Item IV.D1-24, which is identified in GALL Report Table 1, Item 72. Similarly, LRA Table 3.1.2-5, Item 1c, credits Steam Generator Tubing Integrity Program for managing loss of material due to wear for nickel alloy Anti-Vibration Bars in treated water/steam environment. LRA shows consistency with GALL Report Item IV.D1-15, which rolls up to GALL Report Table 1 Item 74. LRA uses the standard Note E, which means this item is consistent with the GALL Report item for material, environment, and aging effect, but a different aging management program is credited. GALL Report items IV.D1-24 and IV.D1-15 recommend the Water Chemistry Control Program and Steam Generator Tubing Integrity Program for managing this component, material, environment, and aging effect combination. During the audit and review, the staff asked the applicant to provide bases for using Steam Generator Tubing Integrity Program alone.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that wear of steam generators anti-vibration bars and tubes is considered an aging effect due to relative motion between surfaces primarily as a result of flow-induced vibration and that as such, control of water chemistry is not effective to manage loss of material due to wear, however, water chemistry controls are generally credited to manage corrosion of the anti-vibration bars and tubes. The applicant stated that the Steam Generator Tubing Integrity Program detects wear of anti-vibration bars and tubes through the use of eddy current testing, visual inspections, and leakage monitoring. The staff agreed with the applicant that the Water Chemistry Control Program is not effective in mitigating loss of material due to wear for the above steam generator components because the program is designed to prevent or mitigate the occurrence of those aging effects induced by corrosive aging mechanisms and not mechanical aging mechanisms (such as wear). The staff reviewed the applicant’s Steam Generator Tubing Integrity Program. The staff’s evaluation is documented in SER Section 3.0.3.2.16. On the basis of these evaluations, the staff finds that the applicant's response to be acceptable and that the applicant does not need to credit the Water Chemistry Control Program in conjunction with the Steam Generator Tube Integrity Program because the Water Chemistry Control Program is not effective in managing loss of material that is induced by wear (i.e., it is only a mitigative program) and because the inspections performed under the Steam Generator Tube Integrity program provide for sufficient condition monitoring of these components.

During the audit and review, the staff asked the applicant to discuss whether loss of material due to erosion or wear is a plausible aging effect for the VEGP feedwater and auxiliary feedwater nozzles, and the feedwater J-tubes.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the design of the VEGP steam generators, including the use of thermal sleeves, essentially eliminates wear/erosion as an aging effect for these components. With respect to the VEGP feedwater and auxiliary feedwater nozzles, the applicant stated that loss of material due to erosion has been evaluated and found to be insignificant. The applicant stated that these components are not susceptible to wear because there are not any other components within close enough proximity to cause surface contact due to relative motion and wear. The applicant also stated that wear caused by impact of hard, abrasive particles is not plausible due to the high quality of the feedwater and that, the VEGP feedwater J-tubes are fabricated from nickel alloy (Alloy 600) which provides superior resistance to erosion or wear when compared to carbon steel materials. The applicant stated that, although erosion is not considered to be an applicable degradation mechanism for the feedwater J-tubes, the J-tubes have been included within the scope of the VEGP Steam Generator Program for Upper Internals as a conservative measure. The staff finds this portion of the applicant's response acceptable, since it is supported by industry operating experience and by WCAP-14757, Westinghouse Aging Management Evaluation for Steam Generators, which indicates that erosion is not a significant aging mechanism for these components and because in spite of this determination, the applicant has conservatively include the feedwater J-tubes within the scope of its Steam Generator Program for Upper Internals.

3.1.2.1.7 Cracking Due to Stress Corrosion Cracking

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 64, states that VEGP manages cracking due to SCC of the stainless steel pressurizer nozzle safe ends (relief, safety, spray, and surge nozzles) and instrument penetrations with the Water Chemistry Control Program and Inservice Inspection Program. LRA Table 3.1.2-1 uses a standard Note E for the AMR items 4a and 7a that roll up to the LRA Table 3.1.1, Item 64. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Item IV.C2-19, which rolls up to GALL Report Table 1 Item 64, identifies cracking due to SCC as an aging effect for stainless steel pressurizer components in reactor coolant environment. The GALL Report recommends GALL AMP XI.M2, "Water Chemistry," for PWR primary water and GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components" for managing this aging effect while the LRA uses the Water Chemistry Control Program and Inservice Inspection Program which is a plant specific program. The staff reviewed the applicant's Water Chemistry Control Program and Inservice Inspection Program, and the staff's evaluations are documented in SER Sections 3.0.3.1.4 and 3.0.3.3.4, respectively. The staff agreed with the applicant's determination that these LRA line items are consistent with the GALL Report, except that the applicant's Inservice Inspection Program is identified as a plant specific AMP for VEGP. The staff's review of the Inservice Inspection Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the basis of the staff's evaluation of the AMP and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 68, states that VEGP manages cracking due to SCC in stainless steel pressure boundary components with the Water Chemistry Control Program and Inservice Inspection Program. LRA Tables 3.1.2-3, 3.1.2-4, and 3.1.2-5 use a standard Note E for the AMR line items that roll up to the LRA Table 3.1.1, Item 68. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Section IV line items that roll up to GALL Report Table 1, Item 68, identify cracking due to SCC as an aging effect for stainless steel or steel with stainless steel cladding reactor coolant system components in reactor coolant environment. The GALL Report recommends GALL AMP XI.M2, "Water Chemistry," for PWR primary water and GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components" for managing this aging effect while the LRA uses the Water Chemistry Control Program and Inservice Inspection Program which is a plant specific program. The staff reviewed the applicant's Water Chemistry Control Program and Inservice Inspection Program, and the staff's evaluations are documented in SER Sections 3.0.3.1.4 and 3.0.3.3.4, respectively. The staff agreed with the applicant's determination that these LRA line items are consistent with the GALL Report, except that the applicant's Inservice Inspection Program is identified as a plant specific AMP for the Votgle LRA. The staff's review of the Inservice Inspection Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the bases of the staff's evaluation of the AMP and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 69, states that VEGP manages cracking due to SCC in the stainless steel reactor pressure vessel (RPV) inlet and outlet nozzle safe ends with the Water Chemistry Control Program and Inservice Inspection Program. It also states that VEGP manages cracking due to PWSCC in the RPV inlet and outlet nozzle to safe end dissimilar metal welds with the Water Chemistry Control Program, Inservice Inspection Program, and Nickel Alloy Management Program for Non- Reactor Vessel Closure Head Penetration Locations. LRA Table 3.1.2-1 uses a standard Note E for the AMR items 18a and 19a that roll up to the LRA Table 3.1.1, Item 69. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Item IV.A2-15, which rolls up to GALL Report Table 1

Item 69, identifies cracking due to SCC or PWSCC as an aging effect for stainless steel or nickel alloy welds and/or buttering in reactor coolant environment. The GALL Report recommends GALL AMP XI.M2, “Water Chemistry,” for PWR primary water and GALL AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components” for managing this aging effect. For the stainless steel welds, the LRA uses the Water Chemistry Control Program and Inservice Inspection Program and the Water Chemistry Control Program, Inservice Inspection Program, which is a plant specific program. For the nickel alloy welds, the LRA uses Nickel Alloy Management Program for Non- Reactor Vessel Closure Head Penetration Locations in addition to the above programs. The staff reviewed the applicant’s Water Chemistry Control Program, Inservice Inspection Program, and Nickel Alloy Management Program for Non- Reactor Vessel Closure Head Penetration Locations. The staff’s evaluations are documented in SER Sections 3.0.3.1.4, 3.0.3.3.4, and 3.0.3.1.1, respectively. The staff agreed with the applicant’s determination that these LRA line items are consistent with the GALL Report, except that the applicant’s Inservice Inspection Program and Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetrations are identified as plant specific AMPs for the Votgle LRA. The staff’s reviews of the Inservice Inspection Program and the Nickel Alloy Management program for Non-Reactor Vessel Closure Head Penetrations include the staff’s assessments of the AMP program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the basis of the staff’s evaluations of the AMPs and the staff’s determination that the applicant’s AMR results are consistent with the GALL Report, the staff finds the applicant’s AMR results to be acceptable.

During the audit and review, the staff noted that the LRA Table 3.1.2-5, Item 28a, credits Water Chemistry Control Program and Steam Generator Tubing Integrity Program for managing cracking due to stress corrosion cracking (SCC) for stainless steel steam generator tube support plates and flow distribution baffles exposed to treated water. LRA shows consistency with GALL Report Item IV.D1-15, which rolls up to GALL Report Table 1 Item 74. However, GALL Report Item IV.D1-15 addresses loss of material due to crevice corrosion and fretting aging effect, for steam generator structural and anti vibration bars. Therefore, the LRA aging effect is different from the GALL Report for this item. Instead, it appears that LRA Table 3.12.-5, Item 28a should have rolled up to GALL Item IV.D1-14 in the GALL Report, Volume 2. During the audit and review, the staff asked the applicant to explain why the LRA has considered LRA Table 3.1.2-5 Item 28a aging effect consistent with the GALL Report Item IV.D1-15.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that LRA Table 3.1.2-5, Item 28a should have been aligned to the GALL Report Item IV.D1-14 instead of IV.D1-15. Item 28a of LRA Table 3.1.2-5 will be revised to link to Item IV.D1-14. The staff confirmed that the applicant revised the LRA in a letter dated March 20, 2008.

During the audit and review, the staff noted that LRA Table 3.1.2-5, Item 23a, credits the Water Chemistry Control Program for managing cracking due to stress corrosion cracking (SCC) for nickel alloy steam outlet flow limiter exposed to steam. LRA shows consistency with GALL Report Item IV.D1-14, which rolls up to GALL Report Table 1 Item 74. LRA uses the standard Note E, which means this item is consistent with the GALL Report item for material, environment, and aging effect, but a different aging management program is credited. However, GALL Report Item IV.D1-14 recommends the Water Chemistry Control

Program and the Steam Generator Tubing Integrity Program for managing this component, material, environment, and aging effect combination. During the audit and review, the staff asked the applicant to provide a basis for using the Water Chemistry Control Program alone.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the VEGP steam outlet flow limiter is exposed to high purity secondary side steam which does not contain the impurities which have been implicated in stress corrosion cracking of thermally treated Alloy 600 tubing. The applicant also stated that the corrosion potentials for these components are significantly different in the main steam environment, as compared with more aggressive areas of the steam generator secondary side (e.g. top of tubesheet region), and also that the applicant did not identify any VEGP or domestic PWR operating experience related to degradation of a thermally treated Alloy 600 main steam flow limiters. The staff finds the applicant's response acceptable based on the quality of high purity of steam and the lack of VEGP-specific and industry-specific operating experience related to this aging effect for the Alloy 600 main steam flow limiter.

3.1.2.1.8 Cracking Due to Primary Water Stress Corrosion Cracking for Nickel Alloy Components

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 65, states that VEGP manages PWSCC of the reactor vessel closure head nickel alloy penetrations with the Water Chemistry Control Program, the Inservice Inspection Program, and the Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations. LRA Tables 3.1.2-1 uses a standard Note E for the AMR items 10a and 13a that roll up to the LRA Table 3.1.1, Item 65. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report items IV.A2-9 and IV-A2-18, which roll up to GALL Report Table 1. Item 65, identify cracking due to PWSCC as an aging effect for nickel alloy components in reactor coolant environment. The GALL Report recommends GALL AMP XI.M2, "Water Chemistry," for PWR primary water, GALL AMP XI.M11-A, "Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads," and GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components" for managing this aging effect while the LRA uses the Water Chemistry Control Program, the Nickel Alloy Management Program for RVCH Penetrations, and the Inservice Inspection Program which is a plant specific program. The staff reviewed the applicant's Water Chemistry Control Program, Nickel Alloy Management Program for RVCH Penetrations, and Inservice Inspection Program, and the staff's evaluations are documented in SER Sections 3.0.3.1.4, 3.0.3.1.1, and 3.0.3.3.4, respectively. The staff agrees with the applicant's determination that these LRA line items are consistent with the GALL Report, except that the applicant's Inservice Inspection Program is identified as a plant specific AMP for VEGP. The staff's review of the Inservice Inspection Program includes the staff's assessments of the AMP program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the basis of the staff's evaluation of the AMPs and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

3.1.2.1.9 Cracking Due to Stress Corrosion Cracking or Thermal and Mechanical Loading

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 70, states that VEGP manages cracking due to SCC with the Water Chemistry Control Program (Appendix B.3.28), Inservice Inspection Program, and the One-Time Inspection Program for ASME Class 1 Small-Bore Piping. LRA Tables 3.1.2-3 uses a standard Note E for the AMR items 8b that rolls up to the LRA Table 3.1.1, Item 70. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Item IV.C2-9, which rolls up to GALL Report Table 1 Item 70, identifies cracking due to SCC as an aging effect for stainless steel Class 1 piping, fittings and branch connections < NPS 4 in reactor coolant environment. The GALL Report recommends GALL AMP XI.M2, “Water Chemistry,” for PWR primary water and GALL AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components” for managing this aging effect. The LRA uses the Water Chemistry Control Program and Inservice Inspection Program which is a plant specific program. The staff reviewed the applicant’s Water Chemistry Control Program and Inservice Inspection Program, and the staff’s evaluation is documented in SER Sections 3.0.3.1.4 and 3.0.3.3.4, respectively. The staff agrees with the applicant’s determination that these LRA line items are consistent with the GALL Report, except using a plant specific AMP. On the basis of the staff’s evaluation of the AMPs and the staff’s determination that the applicant’s AMR results are consistent with the GALL Report, the staff finds the applicant’s AMR results to be acceptable.

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 70 states that VEGP manages cracking due to cyclic loading with the Fatigue and Cycle Monitoring Program, Inservice Inspection Program, and the One-Time Inspection Program for ASME Class 1 Small-Bore Piping. LRA Tables 3.1.2-3 uses a standard Note E for the AMR items 8a that rolls up to the LRA Table 3.1.1, Item 70. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Item IV.C2-9, which rolls up to GALL Report Table 1 Item 70, identifies cracking due to thermal and mechanical loading as an aging effect for stainless steel Class 1 piping, fittings and branch connections < NPS 4 in reactor coolant environment. The GALL Report recommends GALL AMP XI.M2, “Water Chemistry,” for PWR primary water and GALL AMP XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, for Class 1 Components,” and GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-bore Piping" for managing this aging effect. The LRA uses the One-Time Inspection for ASME Class 1 Small Bore Piping, Fatigue Monitoring Program, and Inservice Inspection Program which is a plant specific program. During the audit and review, the staff asked the applicant to clarify whether the aging effect "cracking due to cyclic loading" already postulates the initiation of a fatigue-induced crack in these piping components and justify how the Fatigue Monitoring Program manages cracking due to cyclic loading in these components when the program does not credit any inspections of the components surfaces. The staff also asked the applicant to discuss the inspection methods or techniques and frequency of these inspections that are being used to detect, monitor/trend cracking due cyclic loading

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that, as discussed in Section 3.1.2.2.1 of this document, the applicant will revise LRA Table 3.1.2-3, Item 8a to refer to the GALL Report Item IV.C2-25 that rolls up to Table 1 line 8 instead of GALL Report Item IV.C2-9 which rolls up to Table 1 line 70. The applicant stated that Table 1 Item 70 will not be used by VEGP for cracking due to cyclic loading and that it will amend the LRA to replace the term "cracking due to cyclic loading" with the term "Cracking - Thermal Fatigue," because SNC does not postulate the pre-existence of a fatigue-induced crack. The applicant further stated that component inspections are not performed by the Fatigue Monitoring Program and the program monitors the number of cycles associated with the plant's design basis transients in order to monitor for its impact on the CUF values for these components and to manage cracking due to thermal fatigue. The staff finds the applicant response acceptable since it provided clarification that VEGP does not postulate a fatigue-induced crack for small bore stainless steel Class 1 piping components that are exposed to borated water. The staff confirmed that the applicant made the appropriate amendments of the LRA in a letter dated March 20, 2008.

3.1.2.1.10 Loss of Material/ Erosion, General, Pitting, and Crevice Corrosion

During the audit and review, the staff noted that the discussion in LRA Table 3.1.1, Item 76, states that the VEGP steam generator moisture separator assemblies are aligned to this item as a substitute. VEGP manages loss of material in the steam generator moisture separator assemblies with the Water Chemistry Control Program and the Steam Generator Program for Upper Internals. LRA Table 3.1.2-5 uses a standard Note E for the AMR items 11a and 12a that roll up to the LRA Table 3.1.1, Item 76. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. GALL Report Item IV.D1-9, which rolls up to GALL Report Table 1 Item 76, identifies loss of material/ erosion, general, pitting, and crevice corrosion steel steam generator tube bundle wrapper Secondary feedwater/ steam environment. The GALL Report recommends GALL AMP XI.M19, "Steam Generator Tubing Integrity" and GALL AMP XI.M2, "Water Chemistry," for PWR secondary water for managing this aging effect. The LRA uses the Water Chemistry Control Program and Steam Generator Program for Upper Internals, which is a plant specific program. For the nickel alloy welds, the LRA uses Nickel Alloy Management Program for Non- Reactor Vessel Closure Head Penetration Locations in addition to the above programs.

The staff reviewed the applicant's Water Chemistry Control Program and Steam Generator Program for Upper Internals. The staff verified that the scope of the Steam Generator Program for Upper Internals is credited to manage age related degradation (i.e. loss of material or cracking) in secondary side SG internal components, which are located in the upper regions of SG. The scope of the Water Chemistry Control Program is credited to mitigate or prevent corrosion-induced aging effects (loss or material or cracking) in these components. The staff's evaluations are documented in SER Sections 3.0.3.1.4, and 3.0.3.3.8 respectively. The staff agrees with the applicant's determination that these LRA line items are consistent with the GALL Report, except the applicant is using the Steam Generator Program for Upper Internals, instead of the Steam Generator Tubing Integrity Program and that the applicant has identified its Steam Generator Program for Upper Internals as a plant specific AMP for the Votgle LRA. The staff's review of the Steam Generator Program for Upper Internals includes the staff's assessments of the AMP program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1) and the ability of the AMP to manage loss of material and cracking in the SG upper internal components. On the basis of the staff's evaluations of the AMPs and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable.

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 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 their 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 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.1.2.2, the applicant further evaluated aging management, as recommended by the GALL Report, for the reactor vessel, reactor vessel internals, and RCS 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 (SCC) and intergranular stress corrosion cracking (IGSCC)
- crack growth due to cyclic loading
- loss of fracture toughness due to neutron irradiation embrittlement and void swelling
- cracking due to SCC
- 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 SCC and irradiation-assisted SCC
- cracking due to primary water SCC

- wall thinning due to flow-accelerated corrosion
- changes in dimensions due to void swelling
- cracking due to SCC and primary water SCC
- cracking due to SCC, primary water SCC (PWSCC), and irradiation-assisted SCC (IASCC)
- QA 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 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 3.1.2.2. 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 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.

LRA Table 3.1.1, items 3.1.1-02, 3.1.1-03, and 3.1.1-04, indicate that the AMR result lines are applicable to BWRs. The staff reviewed those AMR result lines in the SRP-LR and in the GALL Report and agrees with the applicant's determination that the lines are not applicable to VEGP which is a PWR.

In reviewing LRA AMR Tables 3.1.1, 3.2.1, 3.3.1, 3.4.1, 3.5.1, and 3.6.1 (Table 1s) the staff noted that these tables include line-items that list TLAA, in the aging management program column, for managing/evaluating identified aging effects, and address their corresponding further evaluation subsections in Section 3 that refer to subsections of LRA Section 4, "Time Limited Aging Analysis," for additional discussions for the LRA Table 1s line-items. However, Section 4.0 does not provide details of the component/structure, material, environment, and aging effects combinations that are evaluated by the TLAA. In addition, the corresponding LRA Table 2s do not identify aging management programs that are credited in accordance with 10 CFR 54.21(c)(1)(iii). During the audit and review, the staff asked the applicant to provide details on the component/structure, material, environment, and aging effect combinations that are evaluated by TLAA, and clearly identify those line-items that credit an aging management program in addition to/instead of a TLAA.

The applicant in its response stated that for those components in VEGP LRA Table 1s that are associated with a TLAA, the further evaluation describes the TLAA and refers to section 4 of the LRA. As such, LRA Table 4.1.2-1 of Section 4 lists the TLAAs applicable to VEGP and identifies the disposition method from 10 CFR 54.21(c)(1). The applicant further stated that for TLAAs where the existing analysis remains valid, i.e. demonstration in accordance with 10 CFR 54.21 (c)(1)(i), or TLAAs where analyses have been projected to the end of the period of extended operation, i.e.10 CFR 54.21 (c)(1)(ii), there is not a resulting aging effect requiring management for the period of extended operation. For these items, there are not associated line items in the AMR results tables (Table 2s) in Section 3. For TLAAs where disposition requires an AMR, i.e. 10 CFR 54.21(c)(1)(iii), an AMR is required and there are associated line items included in the AMR results tables (Table 2s) in Section 3.

The applicant in its response stated that LRA Tables 3.1.2-3 3.1.2-5, 3.1.2-7, and 3.1.2-8 with their associated Table 3.1.1 items will be revised either to correct the existing AMR line items or add AMR line items. Also, the applicant, in its response, stated that VEGP does not have any Table 2 item associated with LRA Table 3.1.1, items 3.1.1-1, 5, 6, 9, 10, 17, and 21.

The applicant in its response stated that LRA Tables 3.1.2-3, 3.1.2-4, and 3.1.2-5 AMR line items as follows:

> For Table 3.1.2-3 items 8a and 9a and for Table 3.1.2-4 items 2b, 3b, 4b, 6b, 7b, 9a, 10a, 11a; the aging effect requiring management will be changed from "Cracking - Cyclic Loading" to "Cracking - Thermal Fatigue", the Fatigue Monitoring Program will be included as the sole aging management program credited, and the GALL linkage will be changed to GALL Item IV.C2-25.
>
> For Table 3.1.2-5 items 2a and 8a, the aging effect requiring management will be changed from "Cracking - Cyclic Loading" to "Cracking - Thermal Fatigue", the Fatigue Monitoring Program will be included as the sole aging management program credited, and the GALL linkage is changed to GALL Item IV.D1-11.
>
> For Table 3.1.2-5 Item 6a, the aging effect requiring management will be changed from "Cracking - Cyclic Loading" to "Cracking - Thermal Fatigue." There is no change to the AMP.

The staff confirmed that the applicant made the appropriate amendment of the LRA in a letter dated March 20, 2008. Therefore, the staff finds the applicant's response acceptable.

In LRA Table 3.1.1, Item 3.1.1-1, under discussion column, the applicant states that this item is not applicable to VEGP, because the VEGP reactor pressure vessels are a Westinghouse design without a support skirt. Therefore, the applicable GALL Report Item IV.A2-20 was not used. The staff noted that Section 5.4.14.2.1 of VEGP UFSAR states that support for the reactor vessel are individual, air cooled, rectangular box structure beneath the vessel nozzles bolted to the primary shield wall concrete. GALL Table 1, line-item 1 identifies cumulative fatigue damage as the aging effect and recommends TLAA evaluation in accordance with 10 CFR 54.21(c). Although VEGP reactor vessels are not supported by a support skirt, the staff finds cumulative fatigue damage aging effect, as identified in GALL Table 1, line-item 1, applicable to the rectangular support structures (listed as Item 17 in LRA Table 3.1.2-1). During the audit and review, the staff asked the applicant to explain why cumulative fatigue damage aging effect is not considered for the VEGP reactor supports.

The applicant in its response stated that cumulative fatigue damage is an applicable TLAA for the VEGP reactor vessel supports. However, the existing TLAA for the VEGP reactor vessel supports, discussed in LRA Section 4.3.4, is demonstrated to be valid for the extended term of operation in accordance with 10 CFR 54.21(c)(1)(i). As such, there is no aging effect requiring management for the period of extended operation based on the TLAA disposition, and these TLAA items are not included in the Table 2s in Section 3. The applicant in its response added that the discussion for Table 1 Item 3.1.1-1 will be revised to clarify that fatigue of the VEGP RPV support pads is a TLAA and is discussed in Section 4.3 of the VEGP LRA.

The staff confirmed that the applicant made the appropriate amendment of the LRA in a letter dated March 20, 2008. Therefore, the staff finds the applicant's response acceptable.

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 criteria in SRP-LR Section 3.1.2.2.2:

LRA Section 3.1.2.2.2 addresses loss of material in once-through SG shell and boiling-water reactor (BWR) reactor vessel components exposed to feedwater and steam as not an AERM because VEGP is a Westinghouse-design PWR with recirculating Model F SGs.

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 feedwater 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 staff reviewed the GALL Report Table 1, the SRP-LR items 11 and 12 and the comparable AMR result lines in the GALL Report (IV.A1-11 and IV.D2-8, respectively). The staff confirmed that the GALL Report and SRP-LR for Item 11 apply to BWRs, and the GALL Report and SRP-LR for Item 12 apply to once-through steam generators only. On the basis that VEGP is not a BWR and the VEGP steam generators are Westinghouse recirculating steam generator, the staff agrees with the applicant's determination that LRA Table 3.1.1, items 11 and 12, are not applicable to VEGP.

LRA Section 3.1.2.2.2 addresses loss of material in BWR isolation condenser components as an aging effect not applicable to VEGP, a PWR plant.

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 staff reviewed the GALL Report Table 1, Item 13, and the comparable AMR result lines in the GALL Report (IV.C1-6) and in the SRP-LR. The staff confirmed that the GALL Report Table 1, Item 13 applies only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant's determination that LRA Table 3.1.1, Item 13 is not applicable to VEGP.

LRA Section 3.1.2.2.2 addresses loss of material in BWR reactor vessel and reactor coolant pressure boundary components as an aging effect not applicable to VEGP, a PWR plant.

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 staff reviewed the GALL Report Table 1, items 14 and 15, and the comparable AMR result lines in the GALL Report (IV.A1-8 and IV.C1-14, respectively) and in the SRP-LR Table 3.1.1, items 14 and 15. The staff confirmed that the GALL Report and SRP-LR comparable line items apply only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant’s determination that LRA Table 3.1.1, items 14 and 15 are not applicable to VEGP.

LRA Section 3.1.2.2.2 addresses loss of material in SG upper and lower shells and transition cones exposed to feedwater and steam and the ability to detect pitting and crevice corrosion described in NRC Information Notice (IN) 90-04 if general and pitting corrosion of the shell are present. For Westinghouse Models 44 and 51 SGs the SRP-LR includes additional inspection requirements.

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 feedwater and steam. The existing program controls chemistry to mitigate corrosion and inservice inspection (ISI) to detect loss of material. The extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds; however, according to NRC Information Notice (IN) 90-04, the program may not be sufficient to detect pitting and crevice corrosion, if general and pitting corrosion of the shell is known to 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.

In LRA Section 3.1.2.2.2, the applicant states that it credits its Water Chemistry Control Program and its Inservice Inspection Program manage loss of material in the SG secondary side pressure boundary components as a result of general, pitting or crevice corrosion. Secondary side SG activities with feedback on secondary side conditions have not found the conditions described in IN 90-04. Steam Generator Program periodic updates consider new industry experience or research data. If information indicates that this issue is of concern for Model F steam generators of similar vintage and operating history, the Steam Generator Program will implement appropriate inspection activities. Since the VEGP reactors are designed Westinghouse Model F SGs, and since the guidance in IN 90-04 is only applicable to Westinghouse Model 44 or Model 51 SGs, the staff concludes that the further evaluation guidance and the additional inspections recommended in the SRP-LR and the GALL Report are not applicable to the applicant’s AMR assessments for the VEGP SGs.

During the audit and review, the staff noted that LRA Table 3.1.2-5, Item 29b, credits the Water Chemistry Control Program, the Inservice Inspection Program, and the Steam Generator Tubing Integrity Program for managing loss of material aging effects for alloy steel tube plates exposed to treated water. The AMR item in the LRA claims consistency with the GALL Report Item IV.D1-12, which rolls up to GALL Table 1 Item 3.1.1-16. It also uses a standard Note E, which means that this AMR item is consistent with the GALL

Report for material, environment, and aging effect, but a different aging management program is credited. However, GALL Report Table 1, Item 16, and GALL Report Item IV.D1-12 address loss of material due to general, pitting, and crevice corrosion for the steam generator (SG) upper and lower shell, and transition cone fabricated from steel and exposed to secondary feedwater/steam and it recommends Water chemistry and ISI programs for managing this aging effect. In addition the GALL Report states that "As noted in NRC IN 90-04, if general and pitting corrosion of the shell is known to exist, the AMP guidelines in Chapter XI.M1 may not be sufficient to detect general and pitting corrosion (and the resulting corrosion-fatigue cracking), and additional inspection procedures are to be developed." During the audit and review, the staff asked the applicant to: a) explain how LRA component type is consistent with the GALL component type for this AMR line-item, b) explain whether the Steam Generator Tube Integrity (SGTI) Program is used to augment the ISI Program, as noted in NRC IN 90-04, and discuss the additional inspections that are performed to detect general and pitting corrosion (and the resulting corrosion-fatigue cracking), and c) explain why the SGTI program is not used for other steam generator components that are rolled up to Table 3.1.1, Item 3.1.1-16 (Table 3.1.2-5 items 2b, 8b, 20a, 21a, 24a, 25a, 29a, 31a, and 32a).

The applicant responded to the staff's question in a letter dated February 8, 2008. In this response the applicant stated that LRA standard Note E does not refer to component type consistency with the GALL Report and that as a result, the application of Note E in the VEGP does not imply component type consistency. The applicant stated that for the SG tubeplate, the VEGP ISI Program, which is implemented in accordance with the requirements of ASME XI, is capable of detecting significant loss of material due to localized corrosion and that visual examinations of the secondary side of the tubeplates performed under the ISI Program and the eddy current examination/ultrasonic examinations performed in accordance with the Steam Generator Tubing Integrity Program will be capable of monitoring for indications of localized corrosion associated with SG tube-to-tubeplate interfaces. The applicant further stated that the LRA Table items listed in part c of the above audit question, except Item 29a, relate to SG secondary side pressure boundary components exposed to treated water and that, because aging management of these ASME Code Safety Class 2 components is not addressed by NEI 97-06, they are not within the scope of the VEGP Steam Generator Program; the applicant did clarify, however, that these components are within the scope of the VEGP ISI Program.

In regard to AMR Item 29a in LRA Table 3.1.2-5, which pertains to the management of loss of material due to general, pitting, and crevice corrosion in the primary side Nickel-alloy cladding in the SG tubeplates the applicant stated that it credits its Water Chemistry Control Program alone to manage loss of material in the tubeplate surfaces that are exposed to the borated water environment of the reactor coolant. The staff finds this to be acceptable because the staff verified that the applicant's AMR is consistent the staff's AMR recommendations in GALL AMR IV.C2-15.

The staff finds that the applicant's response to the staff's inquiry appropriately resolves the issue raised in the question, because it clearly clarifies that the inspections performed under the applicant's Steam Generator Tube Integrity Program will augment those inspections that are implemented under the applicant's Inservice Inspection Program for SG tube plates, and because the applicant's AMR to manage loss of material due to general, pitting and crevice corrosion in the steel SG tube plates is consistent with the AMPs credited in GALL AMR IV.D1-12.

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 concludes 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 criteria in SRP-LR Section 3.1.2.2.3:

LRA Section 3.1.2.2.3 states that neutron irradiation embrittlement 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 4.2 documents the staff's review of the applicant's evaluation of this TLAA.

In the applicant's response letter of February 8, 2008, the applicant stated that SNC will amend the LRA to make the changes to its Type 2 AMR Tables and to provide clarifying detail in the LRA Sections referenced in the Table 1s. Where a TLAA is dispositioned using an aging management program, a note will be added to clarify which Table 2 items are dispositioned by an aging management program. Where a TLAA is not dispositioned using an aging management program, a note will be added to clarify that there are no associated items in the Table 2s. The applicant in its response stated that there are no Table 2 items related to Table 3.1.1, Item 3.1.1-17.

The staff confirmed that the applicant in its letter dated March 20, 2008) provided the above clarification for the AMR line items associated with the Table 3.1.1, Item 3.1.1-17.

LRA Section 3.1.2.2.3 addresses loss of fracture toughness due to neutron irradiation embrittlement as an AERM that the Reactor Vessel Surveillance Program, supported by TLAA evaluations, manages consistent with the SRP-LR. Reactor vessel components that may reach a fluence equal to or greater than 1×10^{17} n/cm^2 (E > 1.0 MeV) prior to the period of extended operation include the intermediate course shells, lower course shells, upper (nozzle) course shells, and the inlet nozzles. The last capsules examined for Units 1 and 2 were exposed to a fluence approximately equal to the expected 60-year operating fluence. Standby surveillance capsules remain in both Units 1 and 2 reactor vessels.

SRP-LR Section 3.1.2.2.3 states that loss of fracture toughness due to neutron irradiation embrittlement may occur in BWR and PWR reactor vessel beltline shell, nozzle, and welds exposed to reactor coolant and neutron flux. A reactor vessel materials surveillance program monitors neutron irradiation embrittlement of the reactor vessel. Reactor vessel surveillance programs are plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further staff evaluation is required for license renewal. Specific recommendations for an acceptable AMP are provided in GALL Report Chapter XI, Section M31.

The staff noted that LRA Table 3.1.2-1 items 14a (intermediate shell course), 16a (lower shell course), and 23a (upper shell course) credit Reactor Vessel Surveillance Program for managing loss of fracture toughness aging effect for these components in borated water environment. However, 10 CFR 50.61 (a)(3) states that "Reactor Vessel Beltline means the region of the reactor vessel (shell material including welds, heat affected zones and plates or forgings) that directly surrounds the effective height of the active core and adjacent regions of the reactor vessel that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most limiting material with regard to radiation damage." During the audit and review, the staff asked the applicant to clarify whether welds are included in these line-items or provide technical justification for excluding welds from the AMR tables.

The applicant responded to the staff's question in a letter dated February 8, 2008. In this response, the applicant stated that weld material used in the reactor pressure vessel component fabrication and the metallurgical effects of the welding techniques employed are included with the base material evaluated in specific reviews of materials and associated aging mechanisms. Therefore, the welds are included in the reactor components (upper, intermediate and lower shell courses) that are managed for loss of fracture toughness by the Reactor Vessel Surveillance Program. The staff finds this response acceptable, because the staff concludes that loss of fracture toughness aging effect of the reactor pressure vessel welds is managed by the Reactor Vessel Surveillance Program.

The staff concludes that the LRA correctly identifies VEGP components that are subject to the aging effect of loss of fracture toughness due to neutron irradiation embrittlement and that associated AMR results in LRA Table 3.1.1, items 3.1.1-18 and 3.1.2-1 are consistent with the recommendations in the GALL Report. The staff reviewed the applicant's Reactor Vessel Surveillance Program, and the staff's evaluation is documented in SER Section 3.0.3.2.15. On the basis of the staff's evaluation of the AMP and the staff's determination that the applicant's AMR results are consistent with the GALL Report, the staff finds the applicant's AMR results to be acceptable. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage the aging effect of loss of fracture toughness due to neutron irradiation embrittlement for carbon steel components clad with stainless steel exposed to reactor coolant.

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 concludes 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 criteria in SRP-LR Section 3.1.2.2.4:

> LRA Section 3.1.2.2.4 addresses cracking of BWR top head enclosure

vessel flange leak detection lines as an aging effect not applicable to VEGP, a PWR plant.

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 staff reviewed the GALL Report Table 1, SRP-LR line Item 19, and the comparable AMR result lines in the GALL Report. The staff confirmed that the GALL Report and SRP-LR line item apply only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant's determination that LRA Table 3.1.1, Item 19 is not applicable to VEGP.

LRA Section 3.1.2.2.4 addresses cracking of BWR isolation condenser components exposed to reactor coolant as aging effect not applicable to VEGP, a PWR plant.

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 staff reviewed the GALL Report Table 1, SRP-LR Table 3.1.1, Item 20, and the comparable AMR result lines in the GALL Report. The staff confirmed that the GALL Report and SRP-LR line item apply only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant's determination that LRA Table 3.1.1, Item 20 is not applicable to VEGP.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5 states that growth of intergranular separations (underclad cracks) in the heat affected zone under austenitic steel cladding 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 4.7 documents the staff's review of the applicant's evaluation of this TLAA.

In LRA Table 3.1.1, Item 3.1.1-21, under discussion column, the applicant states that this item is not applicable to VEGP. Also, in LRA Section 3.1.2.2.5, "Crack Growth due to Cyclic Loading," the applicant states that there are no analyses of underclad flaws in the VEGP reactor vessels and therefore no TLAA exists for VEGP. It further added that there are SA-508 Class 2 forgings clad using high heat input processes in the VEGP reactor pressure vessel. However, weld processes used were subject to qualification and performance testing as described in NRC Regulatory Guide 1.43 to ensure that underclad cracking would not occur.

During the audit and review, the staff noted that SRP-LR Section 4.7.2.1 recommends that the applicant should credit a TLAA to manage postulated crack growth in RPV components fabricated from SA 508, Class 2 or 3 forgings or should demonstrate that the effects of aging on the intended function will be adequately managed for the period of extended function, if no TLAA exists. During the audit and review, the staff asked the applicant to: a) Identify VEGP reactor pressure vessel components/portions that are made of SA-508 Class 2 steel forgings clad with stainless steel, b) provide additional justification for not using TLAA for evaluation of underclad cracking in low-alloy steel safety related components clad with stainless steel, and c) explain how crack growth due to cyclic loading is managed for these components.

The applicant responded to the staff's question in a letter dated February 8, 2008. In this response the applicant stated that the VEGP reactor pressure vessel components that are fabricated from ASME SA-508 Cl. 2 forgings with internal stainless steel cladding material include the closure head dome flanges (Table 3.1.2-1 Item 4), the primary inlet nozzles (Table 3.1.2-1 Item 17), the primary outlet nozzles (Table 3.1.2-1 Item 20), and the vessel flanges (Table 3.1.2-1 Item 25). The applicant stated that it will amend the LRA to indicate that the under-clad cracking analysis in Westinghouse WCAP-15338 is a TLAA for these components, and that the underclad cracking analysis performed by Westinghouse in WCAP-15338 demonstrates that analyzed growth of under-clad cracks in Westinghouse reactor pressure vessel (RPV) components made from these is acceptable through 60-years of license operation. As a result, the applicant stated that, based on the results of the analysis in WCAP-15338, the TLAA on underclad cracking has been demonstrated to be bounding in accordance with the criteria in accordance with 10 CFR 54.21(c)(1)(i). The staff verified that the applicant made the applicable LRA amendment of LRA Sections 3.1 and 4.1, and supplemented the LRA to create LRA TLAA Section 4.7.5, "Underclad Cracking of the Reactor Pressure Vessel," and UFSAR Section A.3.6.5, "Underclad Cracking of the Reactor Pressure Vessel."

The staff finds the applicant response, as supplemented by the applicant's amendments of the LRA in the letter of March 20, 2008, to be acceptable because the applicant has amended the LRA to indicate the TLAA on underclad cracking is credited to manage growth postulated underclad cracks in those RPV components made from SA 508, Class 2 forgings and because this is in conformance with guidance in SRP-LR Section 3.1.2.2.5 .

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.

LRA Section 3.1.2.2.6 addresses loss of fracture toughness due to neutron irradiation embrittlement and void swelling as an AERM that VEGP will manage, consistent with the SRP-LR, by (1) participating in industry programs for investigating and managing aging effects on reactor internals, (2) evaluating and implementing the results of the industry programs applicable to the reactor internals, and (3) submitting an inspection plan for reactor internals to the staff for review and approval upon completion of these programs but at least 24 months before the period of extended operation. This commitment is included in the description of the Reactor Vessel Internals Program and in the UFSAR Supplement description of the program.

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 UFSAR 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.

During the audit and review, the staff confirmed that the applicant in its letter dated June 27, 2007, in Commitment No. 20, stated that it will implement the Reactor Vessel Internals Program, as described in LRA Section A.2.24 and Section B.3.24, based on the following commitments: (1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2.

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 concludes 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 criteria in SRP-LR Section 3.1.2.2.7:

> LRA Section 3.1.2.2.7 addresses cracking due to SCC in the stainless steel reactor pressure vessel flange leakage-monitoring lines and the bottom-mounted instrumentation guide tubes, stating that the Water Chemistry Control Program and the Inservice Inspection Program manage cracking in stainless steel portions of those. The leakage-monitoring lines serve no safety-related function and therefore need management only so leakage has no adverse impact on other components inside containment. The Chemistry Control Program and the plant-specific Inservice Inspection Program manage SCC in the bottom-mounted instrumentation guide tubes. Cracking of the reactor vessel head thermal sleeves is aligned to this summary item as a substitute.
>
> 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. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed.
>
> LRA Table 3.1.2-1 items 2a and 22a credit the Water Chemistry Control Program and Inservice Inspection Program for managing cracking due to SCC for bottom mounted instrumentation guide tubes, and seal table and fittings that are fabricated from stainless steel and exposed to borated water. During the audit and review, the staff reviewed the applicant's license renewal program basis document for reactor coolant pressure boundary systems and other supporting documents. The staff's evaluation of the applicant's Water Chemistry Control Program is documented in SER Section 3.0.3.1.4, and the staff's evaluation of the applicant's Inservice

Inspection Program is documented in SER Section 3.0.3.3.4. On the basis of its review of these programs, the staff finds that the applicant's use of the Water Chemistry Control Program and Inservice Inspection Program are adequate to mitigate and manage cracking due to SCC for stainless steel components in borated water environment.

The staff verified that the applicant credits its Water Chemistry Control Program, Inservice Inspection Program, and Nickel-Alloy Management Program for Non-Reactor Vessel Head Closure Penetrations Program (refer to AMR 3a in LRA Table 3.1.2-1) to manage cracking due to primary water stress corrosion cracking in the Nickel-alloy bottom mounted instrumentation penetrations. The staff verified that this is in conformance with the guidelines in GALL AMR IV.A2-19. The staff finds this to be acceptable because it is in conformance with the staff's recommendations in GALL AMR IV.A2-19.

LRA Section 3.1.2.2.7 addresses cracking due to SCC that may occur in ASME Code Class 1 CASS piping components exposed to reactor coolant, stating that the reactor coolant loop CASS elbows and laterals meet NUREG-0313 guidelines for ferrite content (greater than 7.5 percent) but not for carbon content (less than 0.035 percent). Consistent with the SRP-LR, VEGP the Water Chemistry Control Program and the plant-specific Inservice Inspection Program manage cracking of these castings.

SRP-LR Section 3.1.2.2.7 states that cracking due to SCC may occur in Class 1 PWR CASS reactor coolant system piping, piping components, and piping elements exposed to reactor coolant. The existing program controls water chemistry to mitigate SCC; however SCC may occur in CASS components that do not meet the NUREG-0313 guidelines with regard to ferrite and carbon content. The GALL Report recommends further evaluation of a plant-specific program for these components to ensure this aging effect is adequately managed.

LRA Table 3.1.2-3, Item 10a, identifies cracking due to SCC for the reactor coolant loop piping components that are fabricated of CASS and exposed to borated water and credits the Water Chemistry Control Program and Inservice Inspection Program for managing this aging effect. During the audit and review, the staff reviewed the applicant's license renewal Program basis document for reactor coolant pressure boundary systems and other supporting documents. Based on its review and audit, the staff agrees with the applicant that VEGP meets the guidelines in EPRI TR-105714 and NUREG-0313. The staff's evaluation of the applicant's Water Chemistry Control Program and Inservice Inspection Program is documented in SER Section 3.0.3.1.4 and 3.0.3.3.4, respectively. On the basis of its review of these programs, the staff finds that the applicant's use of the Water Chemistry Control Program and Inservice Inspection Program are adequate to mitigate and manage cracking due to SCC for CASS components in borated water environment.

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 concludes 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 criteria in SRP-LR Section 3.1.2.2.8:

LRA Section 3.1.2.2.8 addresses cracking of BWR jet pump sensing lines due to cyclic loading as an aging effect not applicable to VEGP, a PWR plant.

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 staff reviewed the GALL Report Table 1, SRP-LR line Item 25, and the comparable AMR result lines in the GALL Report. The staff confirmed that the GALL Report and the SRP-LR item apply only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant's determination that LRA Table 3.1.1, Item 25 is not applicable to VEGP.

LRA Section 3.1.2.2.8 addresses cracking of BWR isolation condenser components due to cyclic loading as an aging effect not applicable to VEGP, a PWR plant.

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 staff reviewed the GALL Report Table 1, SRP-LR line Item 26 and the comparable AMR result lines in the GALL Report. The staff confirmed that the GALL Report and the SRP-LR line item apply only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant's determination that LRA Table 3.1.1, Item 26 is not applicable to VEGP.

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.

LRA Section 3.1.2.2.9 addresses loss of preload due to stress relaxation that may occur in stainless steel and nickel alloy PWR reactor internals as an AERM that VEGP will manage, consistent with the SRP-LR, by (1) participating in industry programs for investigating and managing aging effects on reactor internals, (2) evaluating and implementing the results of the industry programs applicable to the reactor internals, and (3) submitting an inspection plan for reactor internals to the staff for review and approval upon completion of these programs but at least 24 months before the period of extended operation. This commitment is included in the description of the Reactor Vessel Internals Program and in the UFSAR Supplement description of the program.

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 UFSAR 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.

During the audit and review, the staff confirmed that, consistent with the GALL Report, the applicant in Commitment No. 20 of Enclosure 2 to the applicant's letter of June 27, 2007, committed to implementing its Reactor Vessel Internals Program, as described in LRA Section A.2.24 and Section B.3.24, based on the following commitments: (1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. The staff finds this to be acceptable because it is in conformance with the recommendations in SRP-LR Section 3.1.2.2.9 and to the AMR items in GALL AMR Table IV.B2 that align to this SRP-LR item.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.9 criteria. For those line items that apply to LRA Section 3.1.2.2.9, the staff concludes 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).

3.1.2.2.10 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.

LRA Section 3.1.2.2.10 addresses erosion in SG impingement plates as an aging effect not applicable because the SGs have no impingement plates but use a recirculating feed-ring design to distribute feedwater.

SRP-LR Section 3.1.2.2.10 states that loss of material due to erosion may occur in steel steam generator feedwater impingement plates and supports exposed to secondary feedwater.

During the audit and review, the staff noted that the VEGP UFSAR Section 5.4.2.2 states that the water entering through the main feed nozzle is distributed circumferentially around the steam generator by means of a feedwater ring and then flows through an annulus between the tube wrapper and shell. The feedwater enters the ring via a welded thermal sleeve connection and leaves it through inverted J-tubes located at the flow holes which are at the top of the ring. The J-tubes are arranged to distribute the bulk of the colder feedwater to the hot leg side of the tube bundle.

On the basis of this review, the staff confirmed that the VEGP steam generators do not have impingement plates; therefore, LRA Table 3.1.1, Item 28, is not applicable to VEGP.

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 BWR stainless steel steam dryers exposed to reactor coolant as an aging effect not applicable to VEGP, a PWR plant.

SRP-LR Section 3.1.2.2.11 states that cracking due to flow-induced vibration could occur for the BWR stainless steel steam dryers exposed to reactor coolant.

The staff reviewed the GALL Report Table 1, SRP-LR line Item 29 and the comparable AMR result lines in the GALL Report. The staff confirmed that the GALL Report and the SRP-LR line Item apply only to BWRs. On the basis that VEGP is not a BWR, the staff agrees with the applicant's determination that LRA Table 3.1.1, Item 29 is not applicable to VEGP.

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.

LRA Section 3.1.2.2.12 addresses cracking due to SCC and IASCC that may occur in stainless steel PWR reactor internals exposed to reactor coolant as an AERM that VEGP will manage, consistent with the SRP-LR, by the Water Chemistry Control Program and by (1) participating in industry programs for investigating and managing aging effects on reactor internals, (2) evaluating and implementing the results of the industry programs applicable to the reactor internals, and (3) submitting an inspection plan for reactor internals to the staff for review and approval upon completion of these programs but at least 24 months before the period of extended operation. This commitment is included in the description of the Reactor Vessel Internals Program and in the UFSAR Supplement description of the program.

SRP-LR Section 3.1.2.2.12 states that cracking due to SCC and irradiation-assisted stress corrosion cracking (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 UFSAR 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.

LRA Table 3.1.2-2 credits the Water Chemistry Control and Reactor Vessel Internals Programs for managing cracking due to SCC for the rector vessel internal components that are fabricated from stainless steel (including CASS) and are exposed to borated water. During the audit and review, the staff confirmed that, consistent with the GALL Report, the applicant, in Commitment No. 20 of Enclosure 2 of the applicant's letter dated June 27, 2007, committed to implementing its Reactor Vessel Internals Program, as described in LRA Section A.2.24 and Section B.3.24, based on the following commitments: (1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. The staff finds this to be acceptable because it is in conformance with the recommendations in SRP-LR Section 3.1.2.2.12 and to the AMR items in GALL AMR Table IV.B2 that align to this SRP-LR item.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.12 criteria. For those line items that apply to LRA Section 3.1.2.2.12, the staff concludes 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).

3.1.2.2.13 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.

LRA Section 3.1.2.2.13 addresses cracking due to PWSCC of nickel alloy components, stating that the Water Chemistry Control Program, Inservice Inspection Program, and Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations manage PWSCC of RPV bottom-mounted instrument penetrations, SG drain connections, and nickel alloy butt welds. The Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations includes a commitment to comply with NRC orders and to implement bulletins, generic letters, and staff-accepted industry guidelines. This commitment is included in the description of the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations and in the UFSAR Supplement description of the program.

The applicant also stated that unlike the GALL Report AMP, the Water Chemistry Control Program and the Reactor Vessel Internals Program VEGP will manage cracking of the core support lugs and pads. The Reactor Vessel Internals Program includes commitments to evaluate and implement the results of industry programs applicable to the reactor internals and to submit an inspection plan for reactor internals to the staff for review and approval upon completion of these programs but at least 24 months before the period of extended operation. The Reactor Vessel Internals Program inspection plan submitted to the staff will implement requirements of any NRC orders, bulletins, or generic letters applicable to cracking of the core support lugs and pads. LRA Table 3.3.2-27 aligns the sampling system pressurizer and RCS sample cooler tubing to this summary item as a substitute. The Alloy 600 tubing extending past the shell of the cooler is within the 10 CFR 54.4(a)(2) scope of license renewal. The Alloy 600 tubing is exposed to high temperature borated water and welded to the stainless steel sampling system piping. Cracking of this tubing could occur due to SCC at this welded location. The Water Chemistry Control Program and the One-

Time Inspection Program will manage cracking of these tubes.

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 reactor coolant pressure boundary 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 UFSAR supplement to implement applicable (1) bulletins and generic letters, and (2) staff-accepted industry guidelines.

LRA Table 3.1.2-4 Item 6a and Table 3.1.2-5, Item 16a, credit the Water Chemistry Control Program, Inservice Inspection Program, and the Nickel Alloy Management Program for Non-RVCH Penetration Locations for managing cracking due to SCC for nickel alloy nozzle dissimilar metal welds, and primary channel head drain connection tube and dissimilar metal weld, respectively. During the audit and review, the staff reviewed the applicant's license renewal Program basis document for reactor coolant pressure boundary systems and other supporting documents. The staff's evaluation of the applicant's Water Chemistry Control Program is documented in SER Section 3.0.3.1.4, and the staff's evaluation of the Inservice Inspection Program is documented in SER Section 3.0.3.3.4.

The staff also confirmed that, consistent with the GALL Report, in Commitment No. 12 of Enclosure 2 to the applicant's letter dated June 27, 2007, the applicant committed to implementing its Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations as described in VEGP LRA Section B.3.14 and Section A.2.24 and based on the following commitments: (1) SNC will continue to participate in industry initiatives directed at resolving PWSCC issues, such as owners group programs and the Electric Power Research Institute Materials Reliability Program, (2) SNC will comply with applicable NRC Orders, and (3) SNC will submit a program inspection plan for VEGP that includes implementation of applicable Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2. The staff finds this to be acceptable because it is in conformance with the recommendations in SRP-LR Section 3.1.2.2.12 and to the AMR items for Nickel-alloy reactor pressure vessel (RPV) and Class 1 piping components in GALL AMR Tables IV.A2 and IV.C2 that align to this SRP-LR item.

LRA Table 3.3.2-27, Item 5k, credits the Water Chemistry Control Program and the One-Time Inspection Program for managing cracking for nickel alloy piping component exposed to borated water with T > 140ºF. LRA claims consistency with the GALL Report IV.C2-13, which rolls up to GALL Table 1, line-item 31. LRA uses a standard Note E, which means Consistent with GALL Report for material, environment, and aging effect, but a different aging management program is credited. However, GALL Report Item IV.C2-13 recommends using Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry" for PWR primary water and comply with applicable NRC Orders and provide a commitment in the UFSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines. During the audit and review, the staff asked the applicant to provide technical justification for using Water Chemistry Control Program and One-Time Inspection Program in lieu of the GALL Report recommended programs.

The applicant provided its response to the staff's inquiry in a letter dated February 8, 2008. In this response, the applicant stated that the above nickel alloy piping components are part of the sample coolers of the NSSS sampling system and have attached Alloy 600 tubes for sampling connections. The coolers are in the non-nuclear safety portion of the system and are not within the scope of the ISI program. Therefore, the applicant credited the combination of its Water Chemistry Control and a One-Time Inspection to manage cracking due to SCC in these nickel alloy components in lieu of the combination of the Inservice Inspection Program and the Water Chemistry Control Program. The staff's evaluation of the applicant's Water Chemistry Control Program is documented in SER Section 3.0.3.1.4, and the staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2.

The staff verified that these Nickel-alloy sampling system components are not reactor coolant pressure boundary (RCPB) components and therefore, that these components are not within the scope of the commitment criteria that the staff recommends in Table IV.C2 of the GALL Report, Volume 2 for management of cracking/PWSCC in Nickel-alloy piping components and elements in the RCPB. Based on this review, the staff finds that it is acceptable to credit the water Chemistry Control Program to mitigate cracking due to PWSCC in these non-safety related nickel alloy sampling piping components and to credit the applicant's One-Time Inspection Program to verify the effectiveness of the Water Chemistry Control Program to manage cracking in these components during the period of extended operation. On the basis of these reviews, the staff finds the applicant's response acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.13 criteria. For those line items that apply to LRA Section 3.1.2.2.13, the staff concludes 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).

3.1.2.2.14 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.

LRA Section 3.1.2.2.14 addresses wall thinning described in Information Notice 91-19 issued to inform licensees of wall thinning due to flow-accelerated corrosion in Combustion Engineering-designed SG feedwater inlet rings and supports. VEGP is a Westinghouse-design plant with Model F SGs so IN 91-12 issues do not apply directly; however, the Steam Generator Upper Internals Program will manage possible wall thinning of the SG feedwater distribution assembly and its supports.

SRP-LR Section 3.1.2.2.14 states that wall thinning due to flow-accelerated corrosion may occur in steel feedwater 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.

LRA Table 3.1.2-5, items 7b, 11b, and 12b, credit Steam Generator Program for Upper internals for managing loss of material due flow accelerated corrosion (FAC) for feedwater distribution assembly piping, fittings, and supports, and steam generator primary and secondary moisture separators fabricated of carbon steel and exposed to treated water/steam. LRA claims consistency with the GALL Report Item IV.D1-26, which rolls up to GALL Table 1 Item 3.1.1-32. GALL Report Item IV.D1-26 and Table 1 Item 3.1.1-32 identify wall thinning due to FAC for this component, material and environment combination, and recommends a plant specific program to be evaluated with reference to NRC IN 91-19, "Steam Generator Feedwater Distribution Piping Damage." During the audit and review, the staff asked the applicant to explain how LRA aging effect is consistent with the GALL Report for this component, material, and environment and discuss the basis for crediting Steam Generator Program for Upper internals.

The applicant provided its response to the staff's inquiry in a letter dated February 8, 2008. In this response the applicant stated that the steam generators (SGs) at VEGP are Westinghouse Model F SGs and that these SGs are of a different design than those addressed in IN 91-19 and do not distribute both feedwater and auxiliary feedwater flow via a common nozzle. Instead, the applicant stated that the Model F SGs includes separate nozzles for normal feedwater and auxiliary feedwater distribution and that operating experience to date has not shown that Model F feedwater distribution assemblies are susceptible to the thermal loadings for the Combustion Engineering SG designs addressed in IN 91-19. The applicant stated that SNC conservatively postulates FAC degradation mechanism for the feedwater ring assembly and moisture separators and credited its Steam Generator Program for Upper Internals to manage loss of material due to FAC in these components.

The applicant also stated that it has performed an assessment based upon SG design, potential degradation mechanisms, and related VEGP and industry operating experience to establish inspection requirements for secondary side internals components and determined that these activities are adequate to detect FAC of carbon steel steam generator internals components prior to a loss of intended function. The staff verified that the Steam Generator Program for Upper Internals includes acceptable criteria to manage loss of materials mechanisms in these components. The staff's evaluation of the applicant's Steam Generator Program for Upper Internals is documented in SER Section 3.0.3.3.8. On the basis of this review, the staff finds that the applicant's use of the Steam Generator Program for Upper Internals is adequate to manage FAC for carbon steel secondary side components of the VEGP steam generator in borated water environment.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.14 criteria.

For those line items that apply to LRA Section 3.1.2.2.14, the staff concludes 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).

3.1.2.2.15 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.

LRA Section 3.1.2.2.15 addresses changes in dimension due to void swelling that may occur in stainless steel and nickel alloy PWR reactor internal components exposed to reactor coolant as an AERM that VEGP will manage, consistent with the SRP-LR, by (1) participating in industry programs for investigating and managing aging effects on reactor internals, (2) evaluating and implementing the results of the industry programs applicable to the reactor internals, and (3) submitting an inspection plan for reactor internals to the NRC for review and approval upon completion of these programs but at least 24 months before the period of extended operation. This commitment is included in the description of the Reactor Vessel Internals Program and in the UFSAR Supplement description of the program.

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 UFSAR 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.

LRA Table 3.1.2-2 credits the Reactor Vessel Internals Programs for managing change in dimension aging effect for the rector vessel internal components that are fabricated from stainless steel and exposed to borated water. During the audit and review, the staff confirmed that, in Commitment No. 20 of Enclosure 2 to the applicant's letter dated June 27, 2007, the applicant commits to implementing its Reactor Vessel Internals Program, as described in LRA Section A.2.24 and Section B.3.24, based on the following commitments: (1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. The staff finds this to be acceptable because it is in conformance with the recommendations in SRP-LR Section 3.1.2.2.15 and to the AMR items in GALL AMR Table IV.B2 that align to this SRP-LR item.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.1.2.2.15 criteria. For those line items that apply to LRA Section 3.1.2.2.15, the staff concludes 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).

3.1.2.2.16 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 criteria in SRP-LR Section 3.1.2.2.16:

(1) LRA Section 3.1.2.2.16 addresses cracking of the reactor pressure vessel control rod drive mechanism pressure housings due to SCC, stating that the VEGP control rod drive mechanism pressure housings (control rod drive mechanism adapter, latch housing, and rod travel housing) are stainless steel requiring no evaluation of commitments to nickel alloy management. The Water Chemistry Control Program and the Inservice Inspection Program manage SCC in the control rod drive mechanism adapters, latch housings, and rod travel housings. The stainless steel conoseal assembly housings and core exit thermocouple nozzle assemblies also are aligned to this item. The Water Chemistry Control Program and the Inservice Inspection Program also manage SCC in these pressure housings. Finally, the reactor vessel thermal sleeves are aligned to this item as a substitute with SCC managed in these sleeves by only the Water Chemistry Control Program. The SRP-LR aligns once-though SG components (LRA Table 3.1.1 Item 34) to this summary item. VEGP has Westinghouse Model F-design recirculating SGs; therefore, once-through SG items are not applicable.

    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 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 lower heads, tubesheets, and tube-to-tube sheet welds made or clad with nickel alloy. 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 UFSAR supplement to implement applicable (1) bulletins and generic letters, and (2) staff-accepted industry guidelines.

In the discussion section of LRA Table 3.1.1, Item 35, the applicant stated that the VEGP steam generators (SGs) are Westinghouse Model F recirculating SGs and not once-through SGs. In addition, the staff verified that, consistent with the information in LRA Table 3.1.2-5, the VEGP SG upper and lower heads, tubesheets, and tube-to tube-sheet welds are made of alloy steel materials without the presence of internal stainless steel or Nickel-alloy cladding.

Based on this review, the staff finds that the recommendations on cracking due PWSCC in SRP-LR Section 3.1.2.2.16, Item (1) and in GALL AMR IV.D2-4 are not applicable to the VEGP LRA because the VEGP SGs are of a recirculating SG design and because the design of the alloy steel upper and lower heads, tubesheets, and tube-to tube-sheet welds in the SGs does not include internal stainless steel or Nickel-alloy cladding.

During the audit, the staff verified that LRA Table 3.1.2-1 does include applicable AMRs on management of cracking due to PWSCC in the stainless steel CRDM, housing adapters, latch housings and travel housings, and in the stainless steel conoseal assemblies (VEGP Unit 1) and core exit thermocouple assemblies (VEGP Unit 2), and that in these AMRs the applicant credits its Water Chemistry Control Program and the Inservice Inspection Program to manage cracking due to PWSCC of the components. The staff finds this to be acceptable because it is in conformance with the staff's recommendations in SRP-LR Section 3.1.2.2.16, Item (1) and in GALL AMR IV.A2-11.

During the audit and review, the staff noted that the applicant does include an additional AMR item on cracking due to SCC (LRA Table 3.1.2-1 AMR Item 26a) in the stainless steel vessel head thermal sleeves under exposure to borated water that has been aligned to GALL AMR IV.A2-11 and in this AMR the applicant credited the Water Chemistry Control Program alone to manage cracking due to SCC. in the reactor vessel head thermal sleeves. During the audit, the staff asked the applicant to justify why the Water Chemistry Program alone is sufficient to manage cracking due to SCC in these thermal sleeves without crediting the Inservice Inspection Program.

The applicant provided its response to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that the thermal sleeve assemblies are shop fabricated and heat treated and that, as such, there are no full penetration field welds associated with this assembly. The applicant also stated that the component materials were tested for corrosion susceptibility at the fabrication shop and that the thermal sleeves are not subject to high tensile stresses, since one end of the thermal sleeve hangs freely into the vessel upper head area, with no restraint. The applicant further stated that, even if cracking is initiated in a region of higher stress, the material is not loaded in such a way as to maintain stress loads and any postulated cracks would be expected to arrest once entering an area of lower stress. The applicant stated that the reducing nature of the primary water chemistry environment has been shown to be generally effective in mitigating stress corrosion cracking and VEGP has no history of stress corrosion cracking at this location.

The staff noted that the thermal sleeves in question are not reactor coolant pressure boundary components and only required to maintain physical integrity to prevent a detrimental impact on safety related components. Three factors need to be present to initiate stress corrosion cracking : (1) high stress field, (2) susceptible material, and (3) corrosive environment. Two of these factors are present for the design of these thermals sleeves: (1) susceptible material (i.e, stainless steel) and (2) corrosive environment (i.e., borated water). However, these thermal sleeves are not loaded to the extent that the CRDM housing and conoseal assemblies are because the thermal sleeves are free hanging and thus are free from restraint on their lower ends, Based on this review, the staff finds the applicant's response acceptable and that it is valid to credit the Water Chemistry Program alone for these thermal sleeves because the CRDM thermal sleeves are not RCPB components and because the applicant has provided an acceptable basis to establish that the stress loads on these sleeves will not be high enough to stress corrosion cracking of the components.

(2) LRA Section 3.1.2.2.16 addresses cracking due to SCC of the pressurizer spray heads as an aging effect not applicable because VEGP pressurizer spray heads are not within the scope of license renewal. LRA Table 3.1.1, line-item 3.1.1-36 states that "This item is not applicable to VEGP. The VEGP Pressurizer Spray Heads do not perform any license renewal intended function. Also see Section 3.1.2.2.16(2)."

    SRP-LR Section 3.1.2.2.16 states that cracking due to SCC may occur on stainless steel pressurizer spray heads. Cracking due to PWSCC may occur on nickel-alloy pressurizer spray heads. The existing program controls water chemistry to mitigate this aging effect.

The staff verified that pressurizer spray heads are not within the scope of license renewal at VEGP. Based on this review, the staff finds that the technical issue raised in SRP-LR Section 3.1.2.2.16, Item (2) is not applicable to the scope of the VEGP LRA.

Based on the programs identified above, the staff concludes that the recommended criteria in SRP-LR Section 3.1.2.2.16, Item (2) are not applicable to the scope of the VEGP LRA.

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.

LRA Section 3.1.2.2.17 addresses cracking due to SCC, PWSCC, and IASCC that may occur in stainless steel and nickel alloy PWR reactor internal components exposed to reactor coolant as AERMs that VEGP will manage, consistent with the SRP-LR, with the Water Chemistry Control Program and by (1) participating in industry programs for investigating and managing aging effects on reactor internals, (2) evaluating and implementing the results of the industry programs applicable to the reactor internals, and (3) submitting an inspection plan for reactor internals to the NRC for review and approval upon completion of these programs but at least 24 months before the period of extended operation. This commitment is included in the description of the Reactor Vessel Internals Program and in the UFSAR Supplement description of the program.

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 UFSAR 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.

LRA Table 3.1.2-2 credits the Water Chemistry Control and Reactor Vessel Internals Programs for managing cracking due to SCC for the rector vessel internal components that are fabricated from stainless steel or nickel alloy and exposed to borated water. During the audit and review, the staff confirmed that, in Commitment No. 20 of Enclosure 2 to the applicant's letter of June 27, 2007, the applicant stated that it will implement the Reactor Vessel Internals Program to manage cracking due to PWSCC in the reactor vessel internal components, as described in LRA Section A.2.24 and Section B.3.24, based on the following commitments: (1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. The staff finds this to be acceptable because it is in conformance with the recommendations in SRP-LR Section 3.1.2.2.17 and to the AMR items in GALL AMR Table IV.B2 that align to this SRP-LR item.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.17 criteria. For those line items that apply to LRA Section 3.1.2.2.17, the staff concludes 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).

3.1.2.2.18 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.

3.1.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.1.2-1 through 3.1.2-5, 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 3.1.2-5, 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.

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 Review – 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 reviewing LRA, Table 3.1.2-1, the staff noted that the applicant credits Water Chemistry Control Program, Inservice Inspection Program, and Nickel Alloy Management Program for non-reactor vessel closure head (Non-RVCH) penetration locations for managing cracking due to SCC for interior of the nickel alloy leakage monitoring tube assembly (Item 15a) in the wetted indoor air environment. The LRA uses a standard Note F, which means that the material is not in the GALL Report for this component. During the audit and review, the staff asked the applicant to provide technical justification for the adequacy of these programs.

The applicant provided its response to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that the nickel alloy leakage monitoring tube assembly is connected to the reactor vessel flange and provides a path to route any reactor coolant leakage from the vessel flange to the reactor coolant drain tank. The applicant stated that the leakage monitoring piping is normally dry unless leakage from the vessel flange exists; thus, its internal environment is air-indoor and wetted due to reactor coolant leakage. The applicant further stated that, since this tubing material is nickel alloy that is exposed to reactor coolant environment, SCC is considered an applicable aging effect for this component.

The applicant added that the VEGP Water Chemistry Control Program is an existing program that mitigates loss of material, cracking, and reduction in heat transfer in system components and structures through the control of detrimental chemical species and the addition of chemical agents. The VEGP Water Chemistry Control Program currently is in conformance with Revision 5 of the EPRI PWR Primary Water Chemistry Guidelines, which recommend that the concentration of chlorides, fluorides, sulfates, lithium, and dissolved oxygen and hydrogen are monitored and kept below the recommended levels to mitigate SCC of austenitic stainless steel, Alloy 600, and Alloy 690 components and include appropriate corrective actions to be taken when primary water chemistry parameters exceed EPRI Action Levels. The applicant stated that inspection of the leakage monitor tube is included in the VEGP Inservice Inspection Program and a VT-2 inspection is performed at each refueling outage in accordance with the ASME Section XI Code as implemented by the VEGP Inservice Inspection Program. Regarding the Nickel Alloy Management Program for Non-RVCH Penetration Locations, the applicant stated that this is a plant-specific program that will manage cracking due to PWSCC for the reactor vessel flange leakage monitor tube. The overall goal of the Nickel Alloy Management Program for Non-RVCH Penetration Locations is to maintain plant safety and minimize the impact of PWSCC on plant availability through assessment, inspection, mitigation, and repair or replacement of susceptible components. Further, the applicant stated that the inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.

The staff's evaluations of the applicant's Water Chemistry Control Program, Inservice Inspection Program, and Nickel Alloy Management Program for Non-RVCH Penetration Locations are documented in SER Section 3.0.3.1.4, 3.0.3.3.4, and 3.0.3.3.5, respectively. The staff finds the applicant's response acceptable because the applicant conservatively treats this leakage monitoring line as a Nickel-alloy reactor coolant pressure boundary component and because the applicant conservatively credits its Water Chemistry Control Program, Inservice Inspection Program, and Nickel Alloy Management Program for Non-RVCH Penetration Locations to manage cracking due to SCC in these Nickel-alloy non pressure boundary leakage lines (tubes). Based on this review, the staff also finds that is acceptable to credit these program for aging management of cracking due to SCC in the Nickel-alloy leakage monitoring tubes because the AMR proposed by the applicant credits more conservative AMPs recommended for management cracking/SCC in GALL AMR IV.A2-5 and are consistent with the AMPs and commitments credited for aging management of cracking due to SCC in Class 1 Nickel-alloy CRDM pressure housings, as described in GALL AMR IV.A2-11,

The staff noted that LRA Table 3.1.2-1, Item 15b, credits Water Chemistry Control and Inservice Inspection Programs for managing loss of material aging effect for interior of the nickel alloy leakage monitoring tube assembly (Item 15a) in the wetted indoor air environment. The LRA uses a standard Note G, which means that the environment is not in the GALL Report for this component and material. During the audit and review, the staff asked the applicant to provide technical justification for the adequacy of these programs to manage this aging effect (i.e., loss of material due to pitting and crevice corrosion).

The applicant provided its response to the staff' inquiry in a letter dated February 8, 2008. In its response, the applicant stated that these leakage monitoring tubes are normally dry and exposure to coolant only occurs in the event of a leak from the vessel inner o-ring. The Water Chemistry Control Program controls ensure that coolant contacting the leakage monitoring tube assembly is low in detrimental ionic species (e.g. chlorides, sulfates) and as such significant corrosion is not promoted. The applicant further stated that the Inservice Inspection Program includes visual examination of the flange surfaces and leak-off region for indications of corrosion and that any indications of leakage or corrosion would result in initiation of a Condition Report and implementation of appropriate corrective actions. The applicant also stated that to-date, there has been no VEGP or domestic PWR experience associated with degradation of this assembly.

The staff finds the applicant's response acceptable because the applicant conservatively credits its Water Chemistry Control Program and Inservice Inspection Program to manage loss of material due to pitting and crevice corrosion in the Nickel-alloy RPV flange leakage tubes and because this is more conservative than the recommendation in GALL AMR IV.A2-14 that the Water Chemistry Program alone is sufficient alone to manage loss of material due to pitting and crevice corrosion in Class 1 Nickel-alloy RPV components. The staff's evaluations of the applicant's Water Chemistry Control and Inservice Inspection Programs are documented in SER Section 3.0.3.1.4 and 3.0.3.3.4, respectively.

In reviewing LRA Table 3.1.2-1, the staff noted that LRA identifies loss of material due to wear as an aging effect for stainless steel vessel head thermal sleeves (Item 26c) exposed to borated water. LRA credits Reactor Vessel Internals Program, which is based on a set of implementation commitments, for managing this aging effect. The LRA uses a standard Note H, which means that the aging effect is not in GALL Report for this component, material, and environment combination. However, the GALL Report items IV.B2-26 and IV.B2-34 recommend using ISI program for managing loss of material due to wear for Class 1 components fabricated from stainless steel and exposed to reactor coolant. During the audit and review, the staff asked the applicant to explain how LRA Item 26c differs from the GALL Report items IV.B2-26 and IV.B2-34, and why the ISI program is not used for managing loss of material due to wear as an aging effect for stainless steel vessel head thermal sleeves exposed to borated water.

The applicant responded to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that SNC does not believe that alignment to GALL Report items IV.B2-26 or IV.B2-34 are appropriate because the loss of material due to wear is not specifically identified as an applicable aging effect requiring management (AERM) In table IV.A2 of the GALL Report, Volume 2, and because there is not any significant operating experience to date that identifies loss of material due to wear as an aging issue for reactor vessel head thermal. The applicant further stated that the nature of any postulated wear for the components in the GALL Report is a slow developing condition and is not associated with a high-cycle flow-induced mechanism and that the applicant's implementation of its Inservice Inspection Program did not identify any indication of wear in these thermal sleeves. The applicant stated that based on these determinations, as such, SNC considers this issue to be an emerging current term issue and that the applicant's implementation of its Reactor Vessel Internals Program will be sufficient to address any wear-induced loss of material issues in the vessel head thermal sleeves during the period of extended operation. The staff finds this to be an acceptable aging management approach for postulated wear in the thermal sleeves because the applicant has included these components in its Reactor Vessel Internal Program and because the program includes Commitment No. 20 on the LRA, which was provided in the applicant's letter of June 27, 2007. This commitment includes the following commitment provisions:

(1) SNC will participate in the industry program for investigating and managing of aging effects on reactor internals. This is an ongoing commitment.

(2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation.

(3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2.

Based on the applicant's response, the staff concludes that loss of material due to wear for the reactor vessel head thermal sleeve will be adequately managed by the Reactor Vessel Internals Program. The staff's evaluation of the applicant's Reactor Vessel Internals Programs is documented in SER Section 3.0.3.3.7.

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 Review – 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.

During the audit and review, the staff noted that LRA Table 3.1.2-2, Item 9d, addresses stainless steel flux thimble tubes in "Air - Indoor (Interior)" environment. LRA uses a standard Note G, which means the environment is not in GALL Report for this component and material. The LRA does not identify an aging effect for this component, material and environment. Therefore, per the applicant, no aging management program is required. During the audit, the staff asked the applicant to explain why this environment is not considered as a "wetted" environment and to provide technical bases for identifying no aging effect for the associated line-item

The applicant provided its response to the staff's inquiry in a letter dated February 8, 2008. In this response, the applicant stated that the flux thimble tubes are movable tubes that are inserted into the fixed flux thimble guide tubes from the seal table, through the flux thimble guide tubes, and into the instrumentation tubes of the fuel assemblies at the applicable core locations. The applicant stated that the external surfaces of the flux thimble tubes are exposed to borated water and the internal surfaces of the flux thimble tubes are dry, and that as such, this environment is not considered to be "wetted" because there is no source of water that could accumulate in the flux thimble tubes. The applicant added that the fact that the flux thimble tubes have an internal indoor environment instead of the external indoor air environment has no affect on the conclusion regarding aging effects for this material and environment combination. In addition, the applicant stated that two decades of operating experience at PWRs throughout the industry confirm that the only significant aging effect for flux thimble tubes is wear of the external surfaces, which is addressed in LRA Table 3.1.2-2, Item 9c. During the audit, the staff found that the applicant's determination that there are not any aging effects for the stainless steel flux thimble tube surfaces that are exposed internally to an indoor air environment is acceptable because the determination is based on extensive operating experience and because this determination is consistent with GALL AMR IV.E-2.

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).

3.1.2.3.3 Reactor Coolant System and Connected Lines - Summary of Aging Management Review – LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of AMR evaluations for the RCS and connected lines component groups.

In reviewing LRA Table 3.1.2-3, the staff noted that the applicant identified no aging effects for the stainless steel capillary tubing for reactor vessel level indicator switch (RVLIS) transmitters that are exposed to a silicone fluid environment. A standard Note G is used for this AMR line, which indicates that the Environment is not in the GALL Report for this component and material. The staff concludes that silicone fluid is nearly chemically inert and has no adverse effects on stainless steel materials in contact with it. On this basis, the staff finds that stainless steel in a silicone fluid environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation.

The staff noted that LRA Table 3.1.2-3, Item 5a, identifies cracking due to SCC as an aging effect for the carbon steel reactor coolant pump (RCP) motor oil cooler channel heads exposed to close-cycle cooling water and credits the Auxiliary Component Cooling Water (ACCW) System Carbon Steel Components Program, which is a new plant specific program, for managing this aging effect. The staff also noted that the applicant added this combination of component, material, environment, and aging effect to the scope of this program, since this combination is not included in the GALL Report. During the audit and review, the staff asked the applicant to provide technical justification for the adequacy of the ACCW System Carbon Steel Components Program.

The applicant responded to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that the RCP lower lube oil coolers are exposed to auxiliary closed cooling water on their tube sides and lube oil on their shell sides. The applicant also stated that the VEGP-specific operating experience indicates that nitrite-induced SCC has been an issue of concern only for the RCP motor oil cooler channel heads at VEGP Unit 2. However, the applicant qualified this by clarifying that, as a conservative measure, nitrite-induced SCC is identified as an applicable aging effect requiring management (AERM) for the RCP motor oil cooler channel heads at both VEGP Unit 1 and VEGP Unit 2.The applicant stated that the ACCW System Carbon Steel Components Program is credited to manage SCC in these components and that the AMP is a new plant-specific program that specifically manages cracking of carbon steel components exposed to auxiliary component cooling water and that the AMP accomplishes this through a combination of leakage detection monitoring, routine walkdown, and periodic visual examination techniques.

The staff verified that the applicant's ACCW System Carbon Steel Components Program is developed and implemented to detect cracking that may occur in carbon steel auxiliary component cooling water system components that are exposed to closed cycle cooling water. The staff's evaluation of the applicant's ACCW System Carbon Steel Components Program is documented in SER Section 3.0.3.3.1. On the basis of this review, the staff finds that the applicant's crediting of the ACCW System Carbon Steel Components Program will provide assurance that cracking of ACCW System carbon steel components due to nitrite induced SCC will be adequately managed such that the components included within the scope of this program will continue to perform their intended function during the period of extended operation and that the applicant's response to the staff's inquiry is acceptable because the program has been developed specifically to detect cracking that may occur in the ACCW system, including cracking due to nitrite-induced SCC, and the applicant will continue to implement this AMP during the period of extended operation.

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 Pressurizer - Summary of Aging Management Review – LRA Table 3.1.2-4

The staff reviewed LRA Table 3.1.2-4, which summarizes the results of AMR evaluations for the pressurizer component groups.

During the audit and review, the staff noted that LRA Table 3.1.2-4, Item 14a, identifies cracking due to SCC as an aging effect for stainless steel for pressurizer surge nozzle and spray nozzle thermal sleeves that are exposed to borated water and that the applicant credits its Water Chemistry Control Program to manage this aging effect. The LRA uses a standard Note J, which means neither the component nor the material and environment combination is evaluated in GALL Report. However, GALL AMR IV.C2-19 recommends that the Water Chemistry and ISI Programs be credited to manage cracking due to SCC in stainless steel pressurizer components that are exposed to reactor coolant. During the audit and review, the staff asked the applicant to explain why LRA Item 14a is not aligned with the GALL Report Item IV.C2-19, and to explain how the effectiveness of Water Chemistry Control Program is verified to ensure that cracking due to SCC is prevented or mitigated in the pressurizer surge nozzle and spray nozzle thermal sleeves. The staff also asked the applicant to provide justification for not crediting the Inservice Inspection Program to manage cracking due to SCC in these thermal sleeves.

The applicant responded to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that the pressurizer stainless steel thermal sleeve components do not serve a pressure retaining function, but rather function as a thermal barrier to protect the structural alloy steel nozzle components from thermal cycling and associated fatigue damage. The applicant explained that these thermal sleeves were rolled into place and then welded to the surge and spray nozzle safe ends using an Alloy 82 dissimilar metal weld. The applicant stated that the other ends of the thermal sleeves are not fixed and are free to expand or contract. The applicant stated that the Water Chemistry Control Program minimizes oxygen and halide concentrations in the reactor coolant system and hydrogen overpressure ensures the presence of low electrochemical corrosion potentials and that under these conditions, SCC has not been a concern for the VEGP stainless steel components.

The applicant also stated that cracking in the weld or roll area is not likely to result in movement of the thermal sleeves since they are tightly fit into the nozzle bore and the rolling process results in improved resistance to IGSCC by placing the sleeve in a compressed state.

The staff has verified that the dissimilar metal welds associated with these thermal sleeves are addressed in AMR Item 6 of LRA Table 3.1.2-4 and are not aligned with the AMRs for the thermal sleeves in LRA Table 3.1.2-4. The staff has evaluated the AMRs that are credited to manage cracking due to SCC in the thermal sleeve dissimilar metal welds in SER Section 3.1.2.2.13.

Based on this review, the staff finds the applicant's response to be acceptable because: (1) the rolling process creates a compressive stress field for the regions of the thermal sleeves that are rolled into position such that any growth of a postulated flaw would be mitigated, and (2) the applicant has address cracking due to SCC of the thermal sleeve dissimilar metal welds in AMR Item 6 of LRA Table 3.1.2-4.

The staff's evaluation of the applicant's Water Chemistry Control Program is documented in SER Section 3.0.3.1.4. On the basis of this review, the staff finds that the Water Chemistry Control Program and continued monitoring of industry operating experience will be adequate to manage cracking due to SCC for free standing regions of the pressurizer surge nozzle and spray nozzle thermal sleeves during the period of extended operation. The staff evaluated aging management programs credited to manage cracking due to SCC in the pressure spray nozzle and surge nozzle thermal sleeve dissimilar metal welds in SER Section 3.1.2.2.13.

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).

3.1.2.3.5 Steam Generators - Summary of Aging Management Review – LRA Table 3.1.2-5

The staff reviewed LRA Table 3.1.2-5, which summarizes the results of AMR evaluations for the steam generators component groups.

During the audit and review, the staff noted that LRA Table 3.1.2-3, items 2c, 8d, 20b, 24b, 25b, 31b, and 32b, address external surfaces of alloy steel steam generator components in external indoor air environments with temperatures in excess of 212 ºF (T> 212 ºF). LRA uses a standard Note G and a plant special Note 106. LRA Note G means that environment for these AMRs is not addressed in the GALL Report for this component and material. LRA Note 106 states that "Revision 1 of NUREG-1801[GALL Report] Vol. 2 does not include an external surfaces environment with operating temperatures exceeding 212 °F. External surfaces operating at temperatures above this threshold drive off moisture and preclude corrosion of the component external surfaces. Additionally, borated water leakage is not a concern for this location."

During the audit and review, the staff asked the applicant to explain how external surfaces of these components remain above 212°F at all times (during reactor operation and shutdown) and to provide technical bases for identifying no aging effect for the associated line-items.

The applicant responded to the staff's question in a letter dated February 8, 2008. In this response, the applicant stated that VEGP normally operates at full power with the external steam generators surface temperature in excess of 212 ºF (i.e., T > 212 ºF) during the 18 month operating cycle. The applicant stated that during the three to four weeks that take place during scheduled refueling outages, the external surfaces of the steam generators are at ambient temperatures.

The applicant concluded that since the external surfaces of the steam generators are exposed to ambient temperatures for relatively short periods of time, corrosion due to atmospheric moisture is not expected to be significant.

Table IV.IX.D provides the following statement on air environments that can lead to condensation or moisture on component surfaces:

> The environment to which the internal or external surface of the component or structure is exposed. Condensation on the surfaces of systems with temperatures below the dew point is considered raw water, due to potential for surface contamination. For the purposes of GALL'05, under certain circumstances, the GALL'01 terms "moist air" or "warm moist air" are enveloped by condensation to describe an environment where there is enough moisture for corrosion to occur.

The GALL environment discussed above indicates that the presence of both moisture and cool or warm environmental conditions are necessary for condensation or moisture to occur on component surfaces. A surface environment above 212 ºF is hot enough to preclude the precipitation of moisture or condensation, that if otherwise present, might induce corrosive type aging effects (loss of material due to general, pitting or crevice corrosion or stress corrosion induced cracking). Based on this review, the staff finds the applicant's response to be acceptable because the external alloy steel SG component surfaces are not exposed to uncontrolled ambient air conditions for any prolonged period of time and because, during power operations, the high temperature air environment (i.e., T > 212 ºF) for the alloy steel components will preclude condensation or moisture from occurring on the component surfaces. Based on this review, the staff concludes that the applicant has described an acceptable basis for concluding that there are not any aging effects for the alloy steel SG components that are exposed to an external indoor air environment with temperatures above 212 ºF.

The applicant also stated that loss of materials due to borated water leakage is the other loss of material aging effect that could potentially require aging management for the external surfaces of steel steam generator (SG) components. The staff verified that LRA Table 3.1.2-5 does include AMR items to manage loss of material due to boric acid corrosion in steel (i.e, carbon steel or alloy steel) SG components that have the potential to be exposed to boric acid leakage of the primary coolant or other borated water sources and that these AMRs have been aligned to and are consistent with the staff's recommendations in AMR Item 58 in Table 1 of the GALL Report, Volume 1, and in GALL AMR IV.D1-3. Based on this review, the staff has verified that the applicant has provided an acceptable basis to manage loss of material in steel SG components that have the potential to be exposed to leakage from borated water sources. The staff has evaluated these AMRs in SER Section 3.1.2.1.

The staff noted that LRA Table 3.1.2-5 credit Fatigue Monitoring Program and Inservice Inspection Program for managing cracking due to cyclic loading as an aging effect for alloy steel auxiliary feedwater nozzle and feedwater inlet nozzle exposed to treated water/ steam. LRA uses a standard Note H, which means that the aging effect is not in the GALL Report for this component, material, and environment combination. During the audit and review, the staff asked the applicant to clarify whether the aging effect "cracking due to cyclic loading" already postulates the initiation of a fatigue-induced crack in these piping components and to justify how the Fatigue Monitoring Program manages cracking due to cyclic loading in these components, when the program does not inspect for existing or postulated fatigue-initiated cracks, but rather relies on cycle monitoring to assure that the TLAAs on thermal fatigue will remain valid for the period of extended operation. The staff also asked the applicant to discuss the inspection methods or techniques and frequency of these inspections that are being used to detect, monitor/trend cracking due cyclic loading.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that SNC will amend LRA Table 3.1.2-5, to align AMR items 2a and 8a to AMR Item 10 in Table 1 of the GALL Report, Volume 1 and to GALL AMR IV.D1-8. The applicant also confirmed that SNC does not postulate the pre-existence of a fatigue-induced crack and VEGP has no components with an aging effect requiring management of "Cracking - cyclic loading. The applicant stated that the SNC interpretation of "cracking due to cyclic loading" was different than the staff's and it now understands the staff's intended use of the term "cracking due to cyclic loading" in GALL. As a result, the applicant stated that SNC will amend the aging effect in those AMRs in the LRA that refer to the term "Cracking - cyclic loading" to the aging effect term "Cracking - Thermal Fatigue," the AMPs in these AMRs to only the Fatigue Monitoring Program. The applicant stated that the program monitors the CUF of those components that require aging management to prevent cracking due to cumulative fatigue damage, component inspections are not performed by the Fatigue Monitoring Program.

The staff issued its question to ensure that the AMRs in the LRA corresponding to the GALL AMRs on cumulative fatigue damage were differentiated from those AMRs in the LRA that pertain to components with already known or postulated thermal fatigue-induced cracks. The staff verified that the applicant made the applicable amendment of the LRA in a letter dated March 20, 2008. The staff also verified that the applicant's Fatigue Monitoring Program is the applicable program that is credited to manage "cracking due to thermal fatigue" in these Class 1 SG components. Based on this review, the staff concludes that the applicant has provided an acceptable AMR basis for managing cracking due to thermal fatigue in the Class 1 SG components. The staff's evaluation of the applicant's Fatigue Monitoring Program is documented in SER Section 3.0.3.2.19. On the basis of this review, the staff finds the applicant's response to the staff's question on these AMRs on thermal fatigue to be acceptable.

The staff noted that LRA Table 3.1.2-5, items 3b and 27d, credit Water Chemistry Control Program for managing loss of material as an aging effect for nickel alloy auxiliary feedwater nozzle thermal sleeve and SG tube plugs exposed to treated water or steam. During the audit and review, the staff asked the applicant to provide technical justification for the adequacy of this program for managing loss of material as an aging effect for these components and to explain how effectiveness of the Water Chemistry Control Program for managing loss of material of auxiliary feedwater nozzle thermal sleeve and tube plugs is verified.

The applicant provided it response to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that the VEGP Water Chemistry Control Program have been shown to be adequate to prevent significant localized corrosion for the auxiliary feedwater thermal sleeve and tube plugs, which are fabricated from thermally treated Alloy 600. The applicant stated that the VEGP Water Chemistry Control Program is implemented consistent with the EPRI water chemistry guidelines for PWR primary and secondary water chemistry and that the program is consistent with the staff's guidelines in GALL AMP

XI.M2. The applicant stated that, at VEGP, the Water Chemistry Control Program implements action levels to limit chemistry excursions and that significant chemistry excursions result in the initiation of a condition report to document the off-normal chemistry conditions, evaluate the consequences, and implement appropriate corrective actions. The applicant further explained that consistent with the VEGP position, an extensive degradation study sponsored by the NRC in NUREG/CR-6923 determined that loss of material due to corrosion is not a significant concern for nickel alloy materials exposed to primary or secondary water environments.

During the audit and review, the staff reviewed the applicant's license renewal Program basis document for the steam generators component groups and other supporting documents. Also, the staff's evaluation of the applicant's Water Chemistry Control Program is documented in SER Section 3.0.3.1.4. The staff concludes that the applicant adequately demonstrated that consistent with the industry guideline loss of material due to localized corrosion for the nickel alloy auxiliary feedwater thermal sleeve and tube plugs is insignificant. Also, any excursion in the water chemistry that may initiate degradation will be identified via implementation of the Water Chemistry Control Program corrective actions. On the basis of these reviews, the staff finds the applicant response acceptable.

During the audit and review, the staff noted that LRA Table 3.1.2-5 credits Water Chemistry Control Program and Steam Generator Tubing Integrity Program for managing loss of material aging effect for nickel alloy steam generator anti-vibration bars (1b) and stainless steel tube support plates and flow distribution baffles (28b) exposed to treated water/steam. Similarly, LRA Table 3.1.2-5 credits Water Chemistry Control Program and Steam Generator Program for Upper Internals for managing loss of material aging effect for the nickel alloy feedwater inlet nozzle thermal sleeve (9b) and J-tubes (10b) exposed to treated water/ steam. During the audit and review, the staff asked the applicant to provide bases for identifying this aging effect and using Water Chemistry Control Program and Steam Generator Tubing Integrity Program or Steam Generator Program for Upper Internals for the associated AMR line-items.

The applicant provided its response to the staff's inquiry in a letter dated February 8, 2008. In its response, the applicant stated that loss of material due to general corrosion is typically only associated with carbon steels which do not develop tightly adherent oxidation layers in the SG coolant or borated water leakage environments. The applicant stated however, that stainless steels and nickel base alloys are protected by passive oxidation layers and that SNC has conservatively included loss of material as an aging effect for nickel alloy and stainless internal components exposed to treated water/steam.

In regard to the AMPs that the applicant has credited to manage corrosion-based loss of material effects in the nickel alloy steam generator anti-vibration bars (1b) and stainless steel tube support plates and flow distribution baffles, the applicant stated that the VEGP Water Chemistry Control Program is an existing program that prevents or mitigates loss of material, cracking, and reduction in heat transfer in system components and structures through the control of detrimental chemical such as chlorides, fluorides, dissolved oxygen, and sulfate concentrations and the addition of chemical agents. The applicant stated that the EPRI Primary Water Chemistry Guidelines and Secondary Water Chemistry Guidelines form the basis for the program.

In the applicant's response letter of February 8, 2008, the applicant also stated that the VEGP Steam Generator Tubing Integrity Program is credited to provide reasonable assurance that the steam generator tubes will perform their intended safety function(s) during the period of extended operation. The applicant stated that monitoring of secondary side components, such as the tube supports, is conducted as part of the Steam Generator Secondary-Side Integrity Plan and that prior to each steam generator tubing inspection, a degradation assessment (DA) is performed to determine and document inspection plans for degradation mechanisms that could potentially occur. The applicant stated that the degradation assessment establishes the inspection scope and NDE techniques for the inspections to be performed and the tube structural limits and flaw growth rates for any flaw evaluations that need to be performed for flaw indications that are detected during the inspection process.

During the audit and review, the applicant presented to the staff recent performance results from the VEGP steam generator programs that show the programs have been effective in finding and correcting degradation attributable to aging effects requiring management. As a result, the staff verified that the applicant's implementation of the Water Chemistry Control Program, the Steam Generator Tubing Integrity Program, and the Steam Generator Program for Upper Internals programs have been effective in managing loss of material in the Nickel-alloy steam generator anti-vibration bars, and the stainless steel tube support plates and flow distribution baffles that are exposed to treated water or steam. Based on this review, the staff finds that the applicant has provided an acceptable basis for crediting the Water Chemistry Control Program and either the Steam Generator Tubing Integrity Program or Steam Generator Program for Upper Internals for the associated AMR line-items that are provided in the LRA to manage loss of material in these steam generator components and therefore, finds the applicant's response to be acceptable. The staff's evaluations of the applicant's Water Chemistry Control Program, Steam Generator Tubing Integrity Program, and Steam Generator Program for Upper Internals are documented in SER Sections 3.0.3.1.4, 3.0.3.2.16, and 3.0.3.3.8, 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).

3.1.3 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 RCS 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 System

This section of the SER documents the staff's review of the applicant's AMR results for the engineered safety features (ESF) system components and component groups of:

- containment spray system
- emergency core cooling system

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for the ESF system components and component groups. LRA Table 3.2.1, "Summary of Aging Management Evaluations for Engineered Safety Features in Chapter V of NUREG-1801," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the ESF 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.

3.2.2 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 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 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.

During the 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 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 or 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 System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system (3.2.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.1)
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 aging management program is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks"	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.2.2)
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	Yes	Not applicable	Not applicable to VEGP (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 aging management program is to be evaluated.	Yes	Not applicable	Not applicable to VEGP (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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.2.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	Yes	Oil Analysis Program (B.3.16) One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.3)
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 aging management program is to be evaluated for pitting and crevice corrosion of tank bottoms because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes	Not applicable	Not applicable to VEGP (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 aging management program is to be evaluated.	Yes	Not applicable	Not applicable to VEGP (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	Yes	Oil Analysis Program (B.3.16) One-Time Inspection Program (B.3.17)	Consistent with the 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	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.2.4)
Elastomer seals and components in standby gas treatment system exposed to air - indoor uncontrolled (3.2.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.2.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.2.6)
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 aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (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	Yes	Not applicable	Not applicable to PWRs (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	Yes	Not applicable	Not applicable to VEGP (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	Yes	Oil Analysis Program (B.3.16) One-Time Inspection Program (B.3.17)	Consistent with the 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 microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.2.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
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	No	Not applicable	Not applicable to PWRs
Cast austenitic stainless steel 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	No	Not applicable	Not applicable to PWRs
High-strength steel closure bolting exposed to air with steam or water leakage (3.2.1-21)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Steel closure bolting exposed to air with steam or water leakage (3.2.1-22)	Loss of material due to general corrosion	Bolting Integrity	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.2.2.1.2)
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	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.2.2.1.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 stress corrosion cracking	Closed-Cycle Cooling Water System	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	No	External Surfaces Monitoring Program (B.3.8)	Consistent with the GALL Report
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	No	One-Time Inspection Program (B.3.17)	Consistent with the GALL Report (See SER Section 3.2.2.1.4)
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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 microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Steel heat exchanger components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Generic Letter 89-13 Program (B.3.12)	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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 microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Stainless steel heat exchanger components exposed to raw water (3.2.1-39)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Generic Letter 89-13 Program (B.3.12) Periodic Surveillance and Preventive Maintenance Program (B.3.21)	Consistent with the GALL Report (See SER Section 3.2.2.1.5)
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Copper alloy > 15% 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	No	One-Time Inspection Program for Selective Leaching (B.3.19)	Consistent with the GALL Report
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Gray cast iron motor cooler exposed to treated water (3.2.1-44)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Aluminum, copper alloy > 15% 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	No	Boric Acid Corrosion Control Program (B.3.3)	Consistent with the GALL Report for carbon steel and cast iron
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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Cast austenitic stainless steel 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	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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 stress corrosion cracking	Water Chemistry	No	Water Chemistry Control Program (B.3.28) One-Time Inspection Program (B.3.17)	Consistent with the GALL Report with an additional one-time inspection not recommended by the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Water Chemistry Control Program (B.3.28)	Consistent with the GALL Report
Aluminum piping, piping components, and piping elements exposed to air - indoor uncontrolled (internal/external) (3.2.1-50)	None	None	No	None	Consistent with the GALL Report (See SER Section 3.2.2.1.1)
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
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	No	None	Consistent with the GALL Report
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	No	None	Consistent with the GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.2.1-54)	None	None	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.2.1-55)	None	None	No	None	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas (3.2.1-56)	None	None	No	None	Consistent with the GALL Report
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.2.1-57)	None	None	No	Not applicable	Not applicable to VEGP (See SER Section 3.2.2.1.1)

The staff's review of the ESF system 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 system components is documented in SER Section 3.0.3.

3.2.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.2.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the ESF system components:

- Bolting Integrity Program
- Boric Acid Corrosion Control Program
- Closed Cooling Water Program
- External Surfaces Monitoring Program
- Generic Letter 89-13 Program
- Oil Analysis Program
- One-Time Inspection Program
- One-Time Inspection Program for Selective Leaching
- Piping and Duct Internal Inspection Program
- Water Chemistry Control Program

LRA Tables 3.2.2-1 and 3.2.2-2 summarize AMRs for the ESF 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 Report 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 Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 Report 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 determined 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 Report 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 Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 or NUREG-1801 identifies a plant specific aging management program. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report 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.

3.2.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.2.1, items 3.2.1-02, -03, -04, -05, -07, -08, -10, -11, -12, -13, -14, -15, -17, -18, -19, -20, -21, -22, -26, -29, -33, -34, -35, -37, -38, -40, -42, -43, -44, -46, -47, -51, and -54 are identified as "Not Applicable" since either the component, material, and environment combination does not exist for VEGP engineered safety features systems, or they are applicable to BWR plants only, or the components are evaluated with their parent system in other sections. For each of these items, the staff reviewed the LRA and the applicant's supporting documents, and confirmed the applicant's claim that the component, material, and environment combination does not exist for VEGP engineered safety features systems. On the basis that VEGP engineered safety features systems do not have the component, material, and environment combination for these Table 1 items, the staff concurs with the applicant's conclusion that these AMRs are not applicable to VEGP engineered safety features systems.

During the audit and review, the staff noted that the discussion column of LRA Table 3.2.1, Item 3.2.1-50 indicated that this Table 3.2.1 item is not applicable to VEGP. However, AMR result items in auxiliary systems reference this Table 3.2.1 item. The staff asked the applicant to clarify this position. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant acknowledged this oversight and stated that it will amend the LRA to address the auxiliary systems AMR result items in the discussion column of LRA Table 3.2.1, Item 3.2.1-50. The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008. On the basis that the applicant has appropriately corrected an error in the LRA, the staff finds this response acceptable.

During the audit and review, the staff also noted that the discussion column of LRA Table 3.2.1, Item 3.2.1-57 indicated that this Table 3.2.1 item is consistent with the GALL Report. However, there are no AMR result items that reference this Table 3.2.1 item. The staff asked the applicant to clarify this position. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant indicated that the AMR process concluded that there are no aging effects for stainless steel and copper alloy (with less than 15 percent zinc) exposed to air with borated water leakage. The staff finds this result is consistent with the GALL Report. The applicant further stated in its response that VEGP did not list multiple lines with no aging effects for a particular component so this Table 3.2.1 was not used as a reference in the AMR result items. The applicant will amend the LRA to indicate in the discussion column of Table 3.2.1, Item 3.2.1-57 that this item was not used. The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008. On the basis that the applicant has appropriately corrected an error in the LRA, the staff finds this response acceptable.

3.2.2.1.2 Loss of Material Due to General, Pitting and Crevice Corrosion

LRA Table 3.2.1, Item 3.2.1-23 states that loss of material of steel bolting and closure bolting exposed to air environments when the component temperature is less than or equal to 212 °F is managed by the plant-specific Bolting Integrity Program. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.2.1, Item 3.3.1-23 refer to Note E.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The applicant developed a plant-specific AMP to manage the effects of aging on steel closure bolting. Therefore, the applicant assigned a Note E to these AMR result items. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The Bolting Integrity Program is a new plant-specific program to manage cracking, loss of material, and loss of preload in mechanical bolted closures. The staff's review of the Bolting Integrity Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1) The VEGP Bolting Integrity Program applies to safety-related and nonsafety-related bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are addressed by the Reactor Vessel Head Closure Stud Program. Visual inspections are conducted to detect loss of preload resulting in joint leakage and to detect fastener degradation due to cracking or loss of material. On the basis of the periodic visual inspections of the closure bolting to detect loss of material, the staff finds the applicant's use of the Bolting Integrity Program acceptable.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.2.2.1.3 Loss of Preload Due to Thermal Effects, Gasket Creep, and Self-Loosening

LRA Table 3.2.1, Item 3.2.1-24, states that loss of preload of steel closure bolting externally exposed to an uncontrolled indoor air environment is managed by the plant-specific Bolting Integrity Program. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.2.1, Item 3.2.1-24, refer to Note E.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The applicant developed a plant-specific AMP to manage the effects of aging on steel closure bolting. Therefore, the applicant assigned a Note E to these AMR result items. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The Bolting Integrity Program is a new plant-specific program to manage cracking, loss of material, and loss of preload in mechanical bolted closures. The staff's review of the Bolting Integrity Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1) The VEGP Bolting Integrity Program applies to safety-related and nonsafety-related bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are addressed by the Reactor Vessel Head Closure Stud Program. Visual inspections are conducted to detect loss of preload resulting in joint leakage and to detect fastener degradation due to cracking or loss of material. On the basis of the periodic visual inspections of the closure bolting to detect loss of preload, the staff finds the applicant's use of the Bolting Integrity Program acceptable.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.2.2.1.4 Loss of Material Due to General Corrosion

LRA Table 3.2.1, Item 3.2.1-32, states that loss of material of steel piping and ducting components and internal surfaces internally exposed to an uncontrolled indoor air environment is managed by the One-Time Inspection Program. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.2.1, Item 3.2.1-32, refer to Note E.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report; however, where the GALL Report recommends the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, the applicant proposed to use the One-Time Inspection Program. Therefore, the applicant assigned a Note E to these AMR result items.

During the audit and review, the staff asked the applicant to justify the use of the One-Time Inspection Program in light of the GALL Report recommendation. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that for the indoor air environment condensation or wetting is not expected. Although, some loss of material due to corrosion is expected, the degree of corrosion for this material and environment is expected to be minor and to progress slowly. The staff finds that based on the lack of condensation or wetting, the aging effect will progress slowly and the use of the One-Time Inspection Program is adequate to confirm this expectation. On this basis, the staff finds the applicant's response acceptable.

The staff's evaluation of the applicant's One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program uses one-time inspections to confirm that either an aging effect is not occurring, or is occurring so slowly as to not affect the component's intended function(s) during the period of extended operation. The staff confirmed that the inspections of internal surfaces of carbon steel and cast iron components exposed to indoor air are included within the scope of the One-Time Inspection Program. On the basis of the use of the one-time visual inspections to detect the loss of material, the staff finds the applicant's use of the One-Time Inspection Program acceptable.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.2.2.1.5 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

For most of the stainless steel heat exchanger components exposed to raw water within the scope of license renewal, the applicant manages loss of material with its Generic Letter 89-13 Program which is consistent with the GALL Report and acceptable. However, for the shell side of the steam generator blowdown sample baths exposed to raw water (well water); the applicant manages the loss of material with its Periodic Surveillance and Preventive Maintenance Activities Program. This program is not consistent with the GALL Report recommendation. Therefore, because the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report, the applicant assigned a Note E to the AMR result item.

During the audit and review, the staff noted that the discussion entry in LRA Table 3.2.1, Item 3.2.1-39, did not recognize the application of the Periodic Surveillance and Preventive Maintenance Activities Program to manage the loss of material for the steam generator blowdown sample baths exposed to raw water. The staff asked the applicant to clarify use of this program for this material and environment combination. The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant indicated that the steam generator blowdown sample baths are nonsafety-related components which are within scope for 10 CFR 54.4(a)(2). Further, because of the well water environment, the applicant stated in its response that new preventive maintenance tasks are to be added to the Periodic Surveillance and Preventive Maintenance Activities Program to conduct these inspections. In addition, the applicant stated that the frequency of these inspections will be established based on the results of the initial inspections such that assurance will be provided that these components will continue to perform their intended function between inspections during the period of expended operation. On the basis of the periodic visual inspections of these components under the Periodic Surveillance and Preventive Maintenance Activities Program and the inspection frequency to be based on the initial inspection results, the staff finds this response and the assignment of Note E to this AMR result item acceptable.

The applicant also stated in its response that it intended to amend the LRA to include information to the discussion column of LRA Table 3.2.1, Item 3.2.1-39, explaining its position on managing the loss of material for the steam generator blowdown sample baths exposed to raw water (well water). The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.2.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.2.2.2, the applicant further evaluated aging management, as recommended by the GALL Report, for the ESF system components and provides information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to cladding breach
- 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
- local 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 microbiologically-influenced corrosion
- QA 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 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 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.

3.2.2.2.2 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.2.2.2.2 against the criteria in SRP-LR Section 3.2.2.2.2.

LRA Section 3.2.2.2.2 addresses loss of material due to cladding breach that may occur for PWR pump casings with stainless steel cladding subjected to borated water as an aging effect not applicable because the centrifugal charging pumps, safety injection pumps, and RHR pumps use solid stainless steel casings.

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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the VEGP centrifugal charging pumps, safety injection pumps, and residual heat removal pumps are fabricated from stainless steel and not from carbon steel with stainless steel cladding. On this basis, the staff concludes that the AMR evaluation in SRP-LR Section 3.2.2.2.2 and LRA Table 3.2.1, Item 3.2.1-02, do not apply to VEGP engineered safety features systems because there are no steel pump casings with stainless steel cladding exposed to treated borated water in the engineered safety features systems.

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 criteria in SRP-LR Section 3.2.2.2.3:

(1) LRA Section 3.2.2.2.3 addresses loss of material due to general, pitting, and crevice corrosion on the internal surfaces of stainless steel containment isolation piping components exposed to treated water as an AERM predicted by the VEGP AMR methodology but AMR results for ESF systems do not use this line item. Containment isolation piping components are evaluated with their parent systems.

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 selected 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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the containment isolation components are evaluated with the parent system. On this basis, the staff finds it acceptable that the AMR result items do not use Table 3.2.1, Item 3.2.1-03.

(2) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion for stainless steel components exposed to soil, raw water, or internal condensation as an aging effect not applicable. The VEGP AMR methodology predicts loss of material for stainless steel piping components exposed to a soil environment, but ESF system AMR results do not include stainless steel piping components exposed to soil environments.

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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the AMR result items for ESF systems do not include stainless steel piping components exposed to soil. On this basis, the staff finds it acceptable that Table 3.2.1, Item 3.2.1-04, is not applicable to the ESF AMR result items.

(3) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in stainless steel or aluminum piping components as an aging effect not applicable to VEGP, a PWR plant.

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.

Based on reviewing the LRA and the applicant's supporting documents, the staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP, a PWR plant.

(4) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in stainless steel and copper alloy components exposed to lubricating oil as an AERM for which one-time inspection is recommended to verify the effectiveness of lubricating oil controls in managing loss of material. Consistent with the GALL Report AMP with exceptions, the Oil Analysis Program and the One-Time Inspection Program manage such loss of material in piping components.

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 the 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 staff reviewed the Oil Analysis Program and the One-Time Inspection Program and determined that the aging effect of loss of material due to pitting and crevice corrosion in stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil will be effectively managed. The Oil Analysis Program maintains the quality of the lubricating oil within acceptable limits, thus preserving an environment that is not conducive to deleterious aging effects. The staff also confirmed that the One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material due to pitting and crevice corrosion for stainless steel and copper alloy components exposed to lubricating oil. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3 by verifying the effectiveness of the Oil Analysis Program by one-time inspections.

(5) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in partially-encased stainless steel tanks exposed to raw water by cracking of the perimeter seal by weathering as an aging effect not applicable because the VEGP refueling water storage tank has a stainless steel liner encased in concrete, not a moisture barrier exposed to raw water.

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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the VEGP refueling water storage tank is encased in concrete and will not be exposed to raw water. On this basis, the staff finds it acceptable that

Table 3.2.1, Item 3.2.1-07, is not applicable to the ESF AMR result items.

(6) LRA Section 3.2.2.2.3 addresses loss of material due to crevice corrosion and pitting in stainless steel components exposed to internal condensation as an aging effect not applicable because the VEGP ESF systems have no stainless steel piping components or tanks exposed to internal condensation.

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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the VEGP AMR result items do not include stainless steel piping components or tank internal surfaces exposed to condensation. On this basis, the staff finds it acceptable that Table 3.2.1, Item 3.2.1-08, is not applicable to the ESF AMR result items.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.3 criteria where applicable. For those line items that apply to LRA Section 3.2.2.2.3, the staff concludes 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 criteria in SRP-LR Section 3.2.2.2.4:

(1) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling that may occur in steel, stainless steel, and copper alloy heat transfer tubes exposed to lubricating oil as an AERM for which the aging management recommended is lube oil chemistry control and a confirmatory one-time inspection. Consistent with the GALL Report AMP with exceptions, the Oil Analysis Program and the One-Time Inspection Program will manage reduction of heat transfer in lubricating oil heat exchanger tubes.

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 selected 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 reviewed the Oil Analysis Program and the One-Time Inspection Program and determined that the aging effect of reduction of heat transfer due to fouling in steel, stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil will be effectively managed. The Oil Analysis Program maintains the quality of the lubricating oil within acceptable limits, thus preserving an environment that mitigates fouling as an aging mechanism to reduce heat transfer through the heat exchanger tubes. The staff also confirmed that the One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage the reduction of heat transfer due to fouling for steel, stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.4 by verifying the effectiveness of the Oil Analysis Program by one-time inspections.

(2) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling that may occur in stainless steel heat exchanger tubes exposed to treated water as an aging effect not applicable because AMR results for the ESF systems do not include heat exchanger tubes exposed to treated, but nonborated water. For heat exchanger tubes exposed to borated water, AMR results do not predict reduction in heat transfer.

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.

Based on reviewing the LRA and the applicant’s supporting documents, the staff confirmed that the VEGP AMR result items for ESF systems do not include stainless steel heat exchanger tubes exposed to treated water. In response to a clarifying question from the staff, the applicant’s response to the staff’s question in a letter dated February 8, 2008 stated that the stainless steel heat exchanger tubes at VEGP are exposed to borated water which does not support an aging effect of reduction of heat transfer due to fouling. The applicant further stated in its response that fouling is not expected because borated water is filtered to remove particulates, de-ionized to remove contaminates and low in oxygen content. On this basis, the staff finds it acceptable that Table 3.2.1, Item 3.2.1-10, is not applicable to the ESF AMR result items.

Based on the programs identified above, the staff concludes that the applicant’s programs meet SRP-LR Section 3.2.2.2.4 criteria where applicable. For those line items that apply to LRA Section 3.2.2.2.4, the staff concludes 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 elastomer hardening and loss of strength in BWR standby gas treatment system ductwork and filters as an aging effect not applicable to VEGP, a PWR plant.

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 standby gas treatment system ductwork and filters exposed to air - indoor uncontrolled.

Based on reviewing the LRA and the applicant's supporting documents, the staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP, a PWR plant.

3.2.2.2.6 Local 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 erosion of high-pressure safety-injection pump minimum flow orifices exposed to borated water by extended use of this pump for normal charging as an aging effect not applicable because VEGP does not use the safety-injection pumps for normal charging so erosion of their minimum flow orifices is not plausible and the pertinent GALL Report line item does not apply.

SRP-LR Section 3.2.2.2.6 states that loss of material due to erosion may occur in the stainless steel high-pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the VEGP high-pressure safety injection pumps are not used for normal charging flow. On this basis, the staff finds it acceptable that Table 3.2.1, Item 3.2.1-12 is not applicable to the ESF AMR result items.

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 loss of material due to general corrosion and fouling for steel drywell and suppression chamber spray system nozzle and flow orifice for internal surfaces exposed to an uncontrolled indoor air environment, as an aging effect.

Based on reviewing the LRA and the applicant's supporting documents, the staff finds acceptable the applicant's evaluation that this aging effect, because it is not applicable to VEGP, a PWR plant.

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 criteria in SRP-LR Section 3.2.2.2.8:

(1) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion that may occur in BWR steel piping components exposed to treated water as an aging effect not applicable to VEGP, a PWR plant.

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.

Based on reviewing the LRA and the applicant's supporting documents, the staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP, a PWR plant.

(2) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion that may occur on the internal surfaces of steel containment isolation piping components exposed to treated water as an AERM predicted by the VEGP AMR methodology but AMR results for ESF systems do not use this line item. Containment isolation piping components are evaluated with their parent system.

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 selected 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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the steel containment isolation components exposed to treated water are evaluated with the parent system. On this basis, the staff finds it acceptable that the AMR result items do not use Table 3.2.1, Item 3.2.1-15.

(3) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion that may occur in steel piping, piping components, and piping elements exposed to lubricating oil as an AERM for which the aging management recommended is oil analysis and a one-time inspection. Consistent with the GALL Report AMP with exceptions, the Oil Analysis Program and the One-Time Inspection program will manage such loss of material in ESF system steel piping components.

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 staff reviewed the Oil Analysis Program and the One-Time Inspection Program and determined that the aging effect of loss of material due to general, pitting and crevice corrosion in steel piping, piping components, and piping elements exposed to lubricating oil will be effectively managed. The Oil Analysis Program maintains the quality of the lubricating oil within acceptable limits, thus preserving an environment that is not conducive to deleterious aging effects. The staff also confirmed that the One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material due to general, pitting and crevice corrosion for steel piping components exposed to lubricating oil. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.8 by verifying the effectiveness of the Oil Analysis Program by one-time inspections.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.8 criteria where applicable. For those line items that apply to LRA Section 3.2.2.2.8, the staff concludes 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 in steel piping elements exposed to soil environments as an AERM (loss of material for buried steel components) predicted by the VEGP AMR methodology, noting that the only related GALL Report AMP is for BWR standby gas treatment system and material for buried steel components and that AMR results for ESF systems do not include any steel piping components exposed to a soil environment.

SRP-LR Section 3.2.2.2.9 states that loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion (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.

Based on reviewing the LRA and the applicant's supporting documents, the staff confirmed that the AMR result items for ESF systems do not include steel piping components exposed to soil. On this basis, the staff finds it acceptable that Table 3.2.1, Item 3.2.1-17 is not applicable to the ESF AMR result items.

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.

3.2.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.2.2-1 and 3.2.2-2, 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 and 3.2.2-2, 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 stated that 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.

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.

3.2.2.3.1 Containment Spray System - Summary of Aging Management Review – LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the containment spray system component groups.

In LRA Table 3.2.2-1, the applicant stated that stainless steel capillary tubing (sealed) for Containment (CTMT) pressure sensors exposed to a silicone interior environment does not exhibit any aging effects requiring management. During the audit and review, the staff confirmed that the silicone material used in these components at VEGP is non-corrosive Dow Corning 702 and that the components are sealed at the factory. Sealing of the sensors at the factory keeps contaminates out of the component interior. The staff also confirmed that site-specific operating experience has shown that no aging effects for these materials have occurred at VEGP. On this basis, the staff finds the applicant's assertion that there is no aging effect requiring management for stainless steel capillary tubing (sealed) for CTMT pressure sensors exposed to a silicone interior environment acceptable.

In LRA Table 3.2.2-1, the applicant stated that stainless steel encapsulation vessels, piping components, spray nozzles, tank - spray additive tank (Unit 2 only), and valve bodies exposed to an interior air-indoor environment does not exhibit any aging effects requiring management. The GALL Report does not indicate any aging effects requiring management for stainless steel exposed to an external uncontrolled air-indoor environment. The staff does not consider there to be any significant difference in the aging effects for stainless steel components exposed internally or externally to an indoor-air environment. Also, during the audit and review, the staff confirmed that site-specific operating experience has shown that no aging effects for these materials have occurred at VEGP. On this basis, the staff finds the applicant's assertion that there is no aging effect requiring management for stainless steel encapsulation vessels, piping components, spray nozzles, tank - spray additive tank (Unit 2 only), and valve bodies exposed to an interior air-indoor environment acceptable.

In LRA Table 3.2.2-1, the applicant proposed to manage the loss of material for carbon steel CTMT spray pumps motor coolers shells exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. During the audit and review, the staff confirmed that the surfaces exposed to ventilation air are mostly dry although some condensation could be present to support corrosion. Based on the lack of moisture, the staff expects that any loss of material would progress slowly if at all. On this basis, the staff finds the application of the One-Time Inspection Program acceptable to manage the loss of material for carbon steel CTMT spray pumps motor cooler shells. Furthermore, the staff confirmed that the applicant has included the internal surfaces of carbon steel components exposed to ventilation air within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel CTMT spray pumps motor cooler shells exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.2.2-1, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an air-indoor external environment using the Bolting Integrity Program.

The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The Bolting Integrity Program description states that bolting and closure inspections will be performed for signs of leakage due to loss of bolt preload. This program is a plant-specific program. The staff's review of the Bolting Integrity Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1).

On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of carbon steel closure bolting exposed to an air-indoor external environment will be effectively managed by the Bolting Integrity 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).

3.2.2.3.2 Emergency Core Cooling System - Summary of Aging Management Review – LRA Table 3.2.2-2

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the emergency core cooling system component groups.

In LRA Table 3.2.2-2, the applicant stated that stainless steel encapsulation vessels and piping components exposed to an interior air-indoor environment do not exhibit any aging effects requiring management. The GALL Report does not indicate any aging effects requiring management for stainless steel exposed to an external uncontrolled air-indoor environment. The staff does not consider there to be any significant difference in the aging effects for stainless steel components exposed internally or externally to an indoor-air environment. Also, during the audit and review, the staff confirmed that site-specific operating experience has shown that no aging effects for these materials have occurred at VEGP. The staff also notes that stainless steel is highly resistant to corrosion in dry atmospheres in the absence of corrosive species. On this basis, the staff finds the applicant's assertion that there is no aging effect requiring management for stainless steel encapsulation vessels and piping components exposed to an interior air-indoor environment acceptable.

In LRA Table 3.2.2-2, the applicant stated that glass sight glasses exposed to an interior air-indoor environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter V line item for this material/environment combination. However, GALL Report Volume 2 does contain line item EP-15 (V.F-6) for engineered safety features systems which apply to glass piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Furthermore, the staff finds that there is no difference in the aging degradation conclusion for this material/environment combination if the component is exposed internally. In addition, the environment for this AMR line item is air-indoor, which is a controlled environment. Therefore, the staff concludes that glass sight glasses exposed to an interior air-indoor environment do not exhibit aging effects requiring management.

In LRA Table 3.2.2-2, the applicant stated that stainless steel refueling water storage tank (RWST) liners exposed to an interior air-outdoor environment do not exhibit any aging effects requiring management. The staff finds this acceptable because the GALL Report indicates that there are no aging effects for stainless steel exposed to uncontrolled indoor air. Furthermore, there is no expectation of age-related degradation for stainless steel in an air-outdoor external environment in the absence of an aggressive environment such as salt air or being in an industrial location. Stainless steel is highly resistant to corrosion in dry atmospheres in the absence of corrosive species, as cited in the Metals Handbook, Volume 3 (p. 65) and Volume 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). During the audit, the staff confirmed that VEGP is not located near the sea or in an industrial location. Therefore, the staff concludes that stainless steel RWST liners exposed to an interior air-outdoor environment do not exhibit aging effects requiring management.

In LRA Table 3.2.2-2, the applicant proposed to manage the loss of material for carbon steel motor cooler shells for the centrifugal charging pumps, residual heat removal (RHR) pumps, and safety injection (SI) pumps exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. During the audit and review, the staff confirmed that surfaces exposed to ventilation air are mostly dry, although some condensation could be present to support corrosion. Based on the lack of moisture, the staff expects that any loss of material would progress slowly, if at all. On this basis, the staff finds the application of the One-Time Inspection Program acceptable to manage the loss of material for carbon steel motor cooler shells for the centrifugal charging pumps, RHR pumps, and SI pumps. Furthermore, the staff confirmed that the applicant has included the internal surfaces of carbon steel components exposed to ventilation air within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel motor cooler shells for the centrifugal charging pumps, RHR pumps, and SI pumps exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.2.2-2, the applicant stated that copper alloy motor cooler shells for the RHR pumps exposed to an interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter V (V.F-3) line item for this material/environment combination. However, GALL Report Volume 2 does contain line item EP-10 for engineered safety features systems which applies to copper alloy piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. During the audit and review, the staff confirmed that the surfaces of components exposed to ventilation air are mostly dry which is similar to the surfaces exposed to an air-indoor environment. Because the GALL Report does not identify any aging effects requiring management for copper alloy piping, piping components, and piping elements exposed to indoor uncontrolled air which is a similar environment to the air-ventilation environment for this copper alloy line item, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that copper alloy motor cooler shells for the RHR pumps exposed to an interior air-ventilation environment do not exhibit aging effects requiring management.

In LRA Table 3.2.2-2, the applicant stated that stainless steel electric heater housings, flow orifice/elements, piping components, pipe spools for startup strainers, sludge mixing pump casings, and valve bodies exposed to an air-outdoor external environment do not exhibit any aging effects requiring management. Based on industry experience, the staff finds that there is no expectation of age-related degradation for stainless steel exposed to outdoor air in the absence of an aggressive environment such as salt air or being in an industrial location. Stainless steel is highly resistant to corrosion in dry atmospheres in the absence of corrosive species, as cited in the Metals Handbook, Volume 3 (p. 65) and Volume 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). During the audit and review, the staff confirmed that VEGP is not located near the sea or in an industrial location. Therefore, stainless steel electric heater housings, flow orifice/elements, piping components, pipe spools for startup strainers, sludge mixing pump casings, and valve bodies exposed to an air-outdoor external environment exhibit no aging effects requiring management, and the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation.

In LRA Table 3.2.2-2, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an air-outdoor or air-indoor external environment and carbon steel closure bolting exposed to an air-outdoor external environment using the Bolting Integrity Program.

The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The Bolting Integrity Program description states that bolting and closure inspections will be performed for signs of leakage due to loss of bolt preload. This program is a plant-specific program. The staff's review of the Bolting Integrity Program includes the staff's assessment of the AMP's program elements against the recommended program element criteria that are provided in Branch Position RLSB-1 in Appendix A of the SRP-LR (i.e., NUREG-1800, Revision 1). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an air-outdoor or air-indoor external environment and carbon steel closure bolting exposed to an air-outdoor external environment will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.2.2-2, the applicant proposed to manage loss of material due to selective leaching for gray cast iron filter housings exposed to an internal environment of lubricating oil using the One-Time Inspection Program for Selective Leaching.

The staff's evaluation of the One-Time Inspection Program for Selective Leaching is documented in SER Section 3.0.3.2.12. The One-Time Inspection Program for Selective Leaching description states that the program will be a one-time inspection program to assess selective leaching in susceptible cast iron and copper alloy components. The program includes a one-time examination of a sample population of components most likely to exhibit selective leaching. The new VEGP program is to provide objective evidence that the aging effect is not occurring, or that the aging effect is occurring slowly enough not to affect the SSCs intended function during the period of extended operation, and thus not require additional aging management. The inspections will be performed within a window of ten years immediately preceding the period of extended operation. If degradation due to selective leaching is identified, additional examinations will be performed. This program is a new program consistent with GALL AMP XI.M33, "Selective Leaching of Materials" with an exception that the program may use other detection techniques instead of, or in addition to, visual examination and hardness measurement. For some component locations, visual examination and hardness measurement may not be feasible due to geometry and configuration issues. Other examination methods which are equally effective in detecting and assessing the extent of selective leaching may be used. Examination techniques may include hardness measurement (where feasible based on form and configuration), visual examination, metallurgical evaluation, or other proven techniques determined to be effective in identifying and assessing the extent of selective leaching. If any conditions are observed which do not meet the acceptance criteria, appropriate actions will be taken to prevent the component from being returned to service until the required corrective actions have been completed. On the basis of its review, the staff finds that the aging effect of loss of material due to selective leaching for gray cast iron filter housings exposed to an internal environment of lubricating oil will be effectively managed by the One-Time Inspection Program for Selective Leaching.

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).

3.2.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the engineered safety features 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).

3.3 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:

- fuel storage racks – new and spent fuel
- spent fuel cooling and purification system
- overhead heavy and refueling load handling systems
- nuclear service cooling water systems
- component cooling water system
- auxiliary component cooling water system
- turbine plant cooling water system
- river intake structure system
- compressed air systems
- chemical and volume control and boron recycle systems
- ventilation systems – control building (CB)
- ventilation systems – auxiliary building (AB)
- ventilation systems – containment building (CTB)
- ventilation systems – fuel handling building (FHB)
- ventilation systems – diesel generator building
- ventilation systems – auxiliary feedwater pumphouse
- ventilation systems – miscellaneous
- ventilation systems – radwaste buildings

- fire protection systems
- emergency diesel generator system
- demineralized water system
- hydrogen recombiner and monitoring system
- drain systems
- potable and utility water systems
- radiation monitoring system
- reactor makeup water storage tank and degasifier system
- sampling systems
- auxiliary gas systems
- chilled water systems
- waste management systems
- thermal insulation
- miscellaneous leak detection systems

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 Auxiliary Systems 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 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 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 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 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 3.3.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.3.2.2.

The staff also conducted a technical review of the remaining AMRs 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.

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 or 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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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 SRP-LR, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Yes	TLAA	Fatigue is not a TLAA (See SER Section 3.3.2.2.1)
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)	Yes	TLAA	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	Yes	Not applicable	Not applicable to PWRs (See SER Section 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 stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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 stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 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 stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Yes	Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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 stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes	Water Chemistry Control Program (B.3.28); One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (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 stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated.	Yes	Water Chemistry Control Program (B.3.28); One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel high-pressure pump casing in PWR chemical and volume control system (3.3.1-9)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable (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 stress corrosion cracking, cyclic loading	Bolting Integrity. The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes	Not applicable	Not applicable (See SER Section 3.3.2.2.4)
Elastomer seals and components exposed to air - indoor uncontrolled (internal/external) (3.3.1-11)	Hardening and loss of strength due to elastomer degradation	A plant-specific aging management program is to be evaluated.	Yes	Periodic Surveillance and Preventive Maintenance Activities Program (B.3.21); Piping and Duct Internal Inspection Program (B.3.22); External Surfaces Monitoring Program (B.3.8)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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 aging management program is to be evaluated.	Yes	Periodic Surveillance and Preventive Maintenance Activities Program (B.3.21); Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	A plant-specific aging management program is to be evaluated.	Yes	Water Chemistry Control Program (B.3.28)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.6)
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	Yes	Oil Analysis Program (B.3.16); One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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	Yes	One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (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	Yes	One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (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	Yes	Not applicable	Not applicable to PWRs (See SER Section 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	A plant-specific aging management program is to be evaluated.	Yes	Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 microbiologically influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Yes	Buried Piping and Tank Inspection Program (B.3.4)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.8)
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 microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes	Diesel Fuel Oil Program (B.3.7); One-Time Inspection Program (B.3.17); Periodic Surveillance and Preventive Maintenance Activities Program (B.3.21)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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 microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis Program (B.3.16)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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	Yes	Not applicable	Not applicable to PWRs (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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.10)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.10)
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 aging management program is to be evaluated.	Yes	External Surfaces Monitoring Program (B.3.8); Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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	Yes	Oil Analysis Program (B.3.16); One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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 aging management program is to be evaluated.	Yes	External Surfaces Monitoring Program (B.3.8); Piping and Duct Internal Inspection Program (B.3.22); Bolting Integrity Program (B.3.2)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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 aging management program is to be evaluated.	Yes	Not applicable	Not applicable (See SER Section 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 aging management program is to be evaluated.	Yes	Buried Piping and Tank Inspection Program (B.3.4)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	Yes	Not applicable	Not applicable to PWRs (See SER Section 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	Yes	Not applicable	Not applicable to PWRs (See SER Section 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 microbiologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Yes	Diesel Fuel Oil Program (B.3.7); One-Time Inspection Program (B.3.17); Fire Protection Program (B3.9)* (*with Diesel Fuel Oil Program applicable to diesel-driven fire pump fuel oil supply line only)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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 microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis Program (B.3.16); One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 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	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable (See SER Section 3.3.2.2.13)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 aging management program is to be evaluated. Reference NRC IN 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks.”	Yes	Not applicable	Not applicable (See SER Section 3.3.2.2.14)
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	No	Not applicable	Not applicable to PWRs
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-37)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	BWR Reactor Water Cleanup System	No	Not applicable	Not applicable to PWRs
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-38)	Cracking due to stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	No	Not applicable	Not applicable to PWRs
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	No	Not used	Not used (See SER Section 3.3.2.1.1)
High-strength steel closure bolting exposed to air with steam or water leakage (3.3.1-41)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)
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	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.3.2.1.3)
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	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.3.2.1.4)
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	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.3.2.1.5)
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 stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Closed Cooling Water Program (B.3.6)	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 microbiologically influenced corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to PWRs
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Closed Cooling Water Program (B.3.6)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)
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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)
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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)
Steel ducting closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-55)	Loss of material due to general corrosion	External Surfaces Monitoring	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Section 3.3.2.1.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	No	External Surfaces Monitoring Program (B.3.8)	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	No	External Surfaces Monitoring Program (B.3.8)	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	No	External Surfaces Monitoring Program (B.3.8)	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	No	External Surfaces Monitoring Program (B.3.8)	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	No	Not used	Not used (See SER Section 3.3.2.1.1)
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	No	Fire Protection Program (B.3.9)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Fire Protection Program (B.3.9)	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel fire rated doors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-63)	Loss of material due to wear	Fire Protection	No	Fire Protection Program (B.3.9)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Fire Protection Program (B.3.9); Diesel Fuel Oil Program (B.3.7)	Consistent with the GALL Report (See SER Section 3.3.2.1.8)
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	No	Fire Protection Program (B.3.9)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Fire Protection Program (B.3.9) And Structures Monitoring Program (B.3.32)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Fire Protection Program (B.3.9)	Consistent with the GALL Report (See SER Section 3.3.2.1)
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Fire Protection Program (B.3.9)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Fire Protection Program (B.3.9)	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-70)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	No	Fire Protection Program (B.3.9)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)
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) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Overhead and Refueling Crane Inspection Program (B.3.20); Structural Monitoring Program (B.3.32)	Consistent with the GALL Report (See SER Section 3.3.2.1.9)
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	No	Overhead and Refueling Crane Inspection Program (B.3.20)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Generic Letter 89-13 Program (B.3.12); Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report (See SER Section 3.3.2.1.12)
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Generic Letter 89-13 Program (B.3.12)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Generic Letter 89-13 Program (B.3.12)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Generic Letter 89-13 Program (B.3.12); Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report (See SER Section 3.3.2.1.10)
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 microbiologically influenced corrosion	Open-Cycle Cooling Water System	No	Not used	Not used (See SER Section 3.3.2.1.1)
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Copper alloy heat exchanger components exposed to raw water (3.3.1-82)	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Generic Letter 89-13 Program (B.3.12); Periodic Surveillance and Preventive Maintenance Activities (B.3.21)	Consistent with the GALL Report (See SER Section 3.3.2.1.11)
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	No	Generic Letter 89-13 Program (B.3.12)	Consistent with the GALL Report (See SER Section 3.3.2.1)
Copper alloy > 15% 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	No	One-Time Inspection Program for Selective Leaching (B.3.19)	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	No	One-Time Inspection Program for Selective Leaching (B.3.19)	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	No	Not used	Not used (See SER Section 3.3.2.1.1)
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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Aluminum and copper alloy > 15% 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	No	Boric Acid Corrosion Control Program (B.3.3)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Boric Acid Corrosion Control Program (B.3.3)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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 stress corrosion cracking	Water Chemistry	No	Water Chemistry Control Program (B.3.28); and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	Water Chemistry Control Program (B.3.28)	Consistent with the GALL Report (See SER Section 3.3.2.1)
Galvanized steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (3.3.1-92)	None	None	No	None	Consistent with the GALL Report (See SER Section 3.3.2.1)
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	No	None	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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Stainless steel and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.3.1-94)	None	None	No	None	Consistent with the GALL Report (See SER 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	No	Not applicable	Not applicable (See SER Section 3.3.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	No	None	Consistent with the GALL Report (See SER 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	No	None	Consistent with the GALL Report (See SER Section 3.3.2.1)
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to dried air (3.3.1-98)	None	None	No	None	Consistent with the GALL Report (See SER Section 3.3.2.1)
Stainless steel and copper alloy < 15% Zn piping, piping components, and piping elements exposed to air with borated water leakage (3.3.1-99)	None	None	No	None	Consistent with the GALL Report (See SER Section 3.3.2.1)

The staff's review of the auxiliary systems component groups followed 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

LRA Section 3.3.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the auxiliary systems components:

- ACCW System Carbon Steel Components Program
- Bolting Integrity Program
- Boric Acid Corrosion Control Program
- Buried Piping and Tanks Inspection Program
- Closed Cooling Water Program
- Diesel Fuel Oil Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Flow-Accelerated Corrosion Program
- Generic Letter 89-13 Program
- Inservice Inspection Program
- Oil Analysis Program
- One-Time Inspection Program
- One-Time Inspection Program for Selective Leaching
- Overhead and Refueling Crane Inspection Program
- Periodic Surveillance and Preventive Maintenance Activities
- Piping and Duct Internal Inspection Program
- Water Chemistry Control Program

LRA Tables 3.3.2-1 through 3.3.2-32 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 Report 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 Report AMP. The staff audited these line items to verify consistency with the GALL

Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 Report 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 determined 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 Report 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 Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 or NUREG-1801 identifies a plant specific aging management program. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

3.3.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.3.1, the staff identified items 41, 42, 53, 54, 71, 75, 81, 87, and 95 as "Not Applicable" since the component/material/environment combination does not exist or is not within the scope of license renewal at VEGP. For each of these line items, the staff reviewed the LRA and the applicant's supporting license renewal basis documents, and confirmed the applicant's claim that the component/material/environment combination does not exist at VEGP. On the basis that VEGP does not have the component/material/environment combination for these Table 1 line items, the staff finds that these AMRs are not applicable to VEGP.

In LRA Table 3.3.1, the staff identified items 40, 60, 65, 66, 67, 80, and 86 as "not used" since the component/material/environment combination is addressed by another Table 1 line item. For each of these line items, the staff reviewed the LRA and license renewal basis document and confirmed that the line item was not used in the LRA. In addition, the staff confirmed that the aging effects addressed by these line items were addressed by other appropriate Table 1 AMR line items. On this basis, the staff finds the applicant's identification of these Table 1 AMR line items as "not used" acceptable.

3.3.2.1.2 Loss of Material Due to Pitting and Crevice Corrosion

In LRA Table 3.3.2-11 and Table 3.3.2-14, the applicant provides a number of AMR items on loss of material in copper alloy auxiliary building or fuel handling building ventilation system component cooling coil components that are exposed to an air-indoor (exterior) (condensation) environment. During the audit and review, the staff noted that the applicant had aligned these AMR items to either GALL AMR Item VII.F1-16 or Item VII.F2-14 under NEI 95-10 formatting Note B. The staff also noted the applicant credited its External Surfaces Monitoring Program to manage loss of material in these components. GALL AMR Item VII.F1-16, recommends that a plant-specific AMP be evaluated and credited to manage this aging effect. The staff asked the applicant to explain why a Note B is shown, consistent with the GALL Report with AMP exceptions, instead of Note E; the GALL Report identifies a plant-specific AMP.

In its response dated February 8, 2008, the applicant stated that Note B for the specified AMR items on these component cooling coil components should be designated as a Note E and that Note E is appropriate because the GALL AMR items VII.F1-16 or Item VII.F2-14 that aligns with these AMR items identify that a plant-specific AMP be credited for aging management, while the AMP credited in the LRA, External Surfaces Monitoring Program, is a GALL Report-based AMP with exceptions taken in the program elements for the AMP. The applicant stated that since a different AMP is credited while the material, environment and aging effect are consistent with the GALL Report, a Note E should have been specified instead of a Note B. The applicant stated that the LRA line item for this component will be amended to change the note from a B to an E. The staff confirmed that the applicant revised the LRA in a letter dated March 20, 2008.

The staff verified that the External Surfaces Monitoring Program is an applicable AMP to credit for managing loss of material due to general, pitting, and crevice corrosion in the external surfaces of metallic components that are susceptible to oxidation (corrosion) in uncontrolled air environments, including those that may expose the components to external condensation. The staff finds the applicant’s response acceptable because the LRA AMR items for these components have been amended to reflect alignment under NEI 95-10 Note format E instead of B and because the External Surface Monitoring Program is an acceptable program to credit for management of loss of material due to general, pitting and crevice corrosion in the external surfaces of metallic components that are exposed to uncontrolled air environments. The staff provides its evaluation of the ability of the External Surfaces Monitoring Program to manage loss of material due to general, pitting, and crevice corrosion in SER Section3.0.3.2.5.

In LRA Table 3.3.1, Item 3.3.1-25, and in LRA Tables 3.3.2-5, 3.3.2-10. 3.3.2-11, 3.3.2-12, 3.3.2-13, and 3.3.2-14, the applicant includes a number of AMRs on management of loss of material of copper alloy HVAC piping, piping components and piping elements in the containment spray, emergency core cooling, component cooling water, chemical and volume control and boron recycle, control building ventilation, auxiliary ventilation, containment building ventilation and fuel handling building ventilation systems under exposure to an external condensation environment. In these AMRs, the applicant credits either the External Surfaces Monitoring Program or Piping and Duct Internal Inspection Program to manage loss of material. During the audit and review, the staff noted that the Type “2” AMR items pointing to LRA Table 3.3.1, AMR Item 3.3.1-25 identified these AMRs as being consistent with GALL under Note E. The staff also noted that the applicant had aligned some of the AMRs on copper alloy HVAC piping, piping components, and piping elements in the containment spray system and the emergency core cooling systems (as described in LRA Tables 3.2.2.-1 and 3.2.2-2 for emergency safety feature components) to LRA AMR Item 3.3.1-25 and that, like AMR counterparts for the some of auxiliary system HVAC components, the applicant credited the Piping and Duct Internal Inspection Program to manage loss of material in these emergency safety feature HVAC components.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report.

However, where the GALL Report recommends a plant-specific AMP, the applicant proposed the External Surfaces Monitoring Program or the Piping and Duct Internal Inspection Program, which are GALL-based AMPs for the VEGP LRA.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. On the basis of the periodic visual inspections of the piping, piping components, ducting, and other components to detect loss of material, the staff finds the applicant’s use of the External Surfaces Monitoring Program acceptable.

The VEGP Piping and Duct Inspection Program is a new program that will manage corrosion of steel, stainless steel, and copper alloy components. Components included within the scope of this program are not addressed by other VEGP aging management programs. The VEGP Piping and Duct Internal Inspection Program will monitor not only component surfaces through visual inspection, but may also use non-visual techniques to monitor parameters such as wall thickness and elasticity. On the basis of the periodic visual and non-visual technique inspections of the piping, piping components, ducting, and other components to detect loss of material, the staff finds the applicant’s use of the Piping and Duct Inspection Program acceptable.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report. The staff‘s evaluations of the External Surfaces Monitoring Program and Piping and Duct Internal Inspection Program are documented in SER Sections 3.0.3.2.5 and 3.0.3.2.13, respectively.

3.3.2.1.3 Loss of Material Due to General, Pitting, and Crevice Corrosion In Closure Bolting

LRA Table 3.3.1, AMR items 3.3.1-43 and 3.3.1-44 provide the applicant’s AMRs on management of loss of material due general, pitting and crevice corrosion in miscellaneous steel auxiliary system closure bolts that are exposed to either, uncontrolled indoor air, outdoor air, or condensation environments. In these AMRs, the applicant credits its Bolting Integrity Program to manage loss of material due to general, pitting, and crevice corrosion in the bolts. During the audit and review, the staff noted that the Type “2” AMR items pointing to LRA Table 3.3.1, AMR items 3.3.1-43 and 3.3.1-44 identified these AMRs as being consistent with GALL under Note E.

The corresponding AMR items in the GALL Report are AMR items 43 and 44 in Table 3 of the GALL Report, Volume 1. The GALL Report recommends using GALL AMP XI.M.18, “Bolting Integrity,” to manage loss of material in these bolting components. The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those recommended in the corresponding AMR items in the GALL Report. The staff noted that the applicant’s Bolting Integrity Program is a plant-specific program for the LRA.

The staff verified that the scope of the applicant’s Bolting Integrity Program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant’s Reactor Vessel Head Closure Stud Program. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff’s evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff’s recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]).

LRA Table 3.3.1, AMR Item 3.3.1-55 provides the applicant’s AMR on management of loss of material due general, pitting and crevice corrosion in ducting (HVAC) closure bolts that are exposed to uncontrolled indoor air. In this AMR, the applicant credits its Bolting Integrity Program to manage loss of material in the closure bolts. During the audit and review, the staff noted that the Type “2” AMR items pointing to LRA Table 3.3.1, Item 3.3.1-55 identified the AMRs as being consistent with GALL under Note E.

The corresponding GALL AMR Item is AMR Item 55 in Table 3 of the GALL Report, Volume 1. The staff reviewed the applicant’s AMR item and noted that the component type, material, environment, and aging effect are consistent with those described in the corresponding AMR item in the GALL Report. However, the staff also noted that the GALL Report recommends that GALL AMP XI.M36, “External Surfaces Monitoring,” be credited for aging management whereas the applicant has credited its Bolting Integrity Program, which is a plant-specific program for the LRA. The staff evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2.

The staff verified that the applicant’s Bolting Integrity Program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant’s Reactor Vessel Head Closure Stud Program. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff’s evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff’s recommended criteria for AMP program elements in

Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). Based on this review, the staff finds that it is acceptable to credit the Bolting Integrity Program as an alternative program to manage loss of material in these steel duct bolting components.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant appropriately addressed the aging effects or mechanisms as recommended by the GALL Report.

3.3.2.1.4 Loss of Preload Due to Thermal Effects, Gasket Creep, and Self-loosening In Bolting Components

LRA Table 3.3.1, AMR Item 3.3.1-45 provides the applicant's AMR on management of loss of preload in miscellaneous auxiliary system steel closure bolting under exposure to uncontrolled indoor air. In this AMR, the applicant credits its Bolting Integrity Program to manage loss of preload in the bolting components. During the audit and review, the staff noted that the Type "2" AMR items pointing to LRA Table 3.3.1, Item 3.3.1-45 identified these AMRs as being consistent with GALL under Note E.

The corresponding GALL AMR item is AMR Item 45 in Table 3 of the GALL Report, Volume 1. In this AMR, the GALL Report recommends using GALL AMP XI.M18, "Bolting Integrity," to manage loss of preload in the bolting components. The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff also noted that, although the applicant credited its Bolting Integrity Program, the Bolting Integrity Program is a plant-specific program for the LRA.

The staff verified that the applicant's Bolting Integrity Program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity Program includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]).

On the basis of its review of the AMR result item as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant appropriately addressed the aging effect or mechanism as recommended by the GALL Report.

3.3.2.1.5 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

During the audit and review, the staff noted that LRA Table 3.3.2-10 includes an AMR item on management of loss of material due to pitting, crevice, and galvanic corrosion in stainless steel normal charging pump motor cooler tubesheets for the surfaces that are exposed to closed-cycle cooling water. In this AMR, the staff noted that the applicant credited its Closed-Cycle Cooling Water Program to manage loss of material in these stainless steel components. The staff noted that the applicant aligned this Type “2” AMR item to GALL AMR Item VII.E1-2 and to LRA AMR Item 3.3.1-51, which pertain to the management of loss material in copper alloy piping, piping component, piping elements, and heat exchanger components that are exposed to the same environment. The GALL AMR recommends that the AMP XI.M21, “Closed-Cycle Cooling Water System Program,” be credited to manage loss of material due to pitting, crevice and galvanic corrosion in the copper alloy component surfaces that are exposed to closed cycle cooling water.

The staff asked the applicant to explain why the aging management program in the AMR item associated with the GALL AMR Item VII.E1-2 is appropriate to manage loss of material due to pitting, crevice, and galvanic corrosion in these stainless steel components.

In its response dated February 8, 2008, the applicant stated that the Type “2” AMR item in LRA Table 3.3.2-10 for the CVCS normal charging pump motor cooler tubesheets incorrectly aligned the AMR item to LRA Table 3.3.1 AMR Item 3.3.1-51 and to GALL AMR VII.E1-2. The applicant stated that, since the component is made of stainless steel and not copper alloy, the AMR item should have been aligned to LRA Table 3.2.1 AMR Item 3.2.1-28 and to GALL AMR Item V.D1-4. The applicant stated that the LRA line item for this component in Table 3.3.2-10 will be amended to reflect alignment to LRA Table 3.2.1 AMR Item 3.2.1-28 and to GALL AMR Item V.D1-4. The applicant also stated that this change is administrative and does not alter the AMP (i.e., the Closed-Cycle Cooling Water Program) that is credited to manage loss of material in the component surfaces that are exposed to closed-cycle cooling water.

The staff confirmed that the applicant made the applicable amendment of the LRA in a letter dated March 20, 2008. The staff also reviewed the recommendations in GALL AMR V.D1-4 and verified that, like the recommendation in GALL AMR VII.E1-2 for copper alloy components, GALL AMR V.D1-4 recommends that GALL AMP XI.M21, “Closed-Cycle Cooling Water System,” be credited to manage loss of material due to corrosion effects in stainless steel heat exchanger component surfaces that are exposed to close-cycle cooling water. Based on this review, the staff finds that the change in the LRA is an administrative change of the application and that the applicant has provided an acceptable basis for crediting the Closed-Cycle Cooling Water Program for these stainless steel components. The staff’s question on this matter is resolved.

On the basis of its review of the AMR result item as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant appropriately addressed the aging effect or mechanism as recommended by the GALL Report.

3.3.2.1.6 Loss of Material Due to General, Pitting, and Crevice Corrosion

LRA Table 3.3.1, AMR Item 3.3.1-64 provides the applicant’s AMR for managing loss of material of steel auxiliary system piping, piping components, and piping elements that are exposed to fuel oil. In this AMR, the applicant credited its Fire Protection Program and Fuel Oil Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion in component surfaces that are exposed to fuel oil. During the audit and review, the staff noted the Type “2” AMR result items pointing LRA Table 3.3.1, Item 3.3.1-64 identified these AMRs as being consistent with GALL under Note E.

The corresponding GALL AMR items are AMR Item 64 in Table 3 of the GALL Report, Volume 1 and AMR Item VII.G-21 in the GALL Report Volume 2 (GALL AMR VII.G-21). These GALL AMRs recommend that GALL AMP XI.M26, “Fire Protection,” and GALL AMP XI.M30, “Fuel Oil Chemistry,” be credited to manage loss of material due to general, pitting, and crevice corrosion in the components surfaces that are exposed to fuel oil.

The staff reviewed the AMR result items referring to Note E and verified that the component type, material, environment, and aging effect are consistent with the corresponding AMR items in the GALL Report. The staff also verified that the applicant credited its Diesel Fuel Oil Program and its Fire Protection Program to manage loss of material in the component surfaces that are exposed to fuel oil. The staff verified that the applicant’s Fire Protection Program is an existing AMP that is consistent with the recommendations in both GALL AMP XI.M26, “Fire Protection,” and GALL AMP XI.M27, “Fire Water System,” and that the program includes an exception to GALL and three enhancements of the program in order to make it consistent with the program elements in the GALL. The staff also verified that the scope of the AMP includes the fuel oil delivery lines for both the diesel driven fire pumps and emergency diesel generators. The staff’s evaluation of the applicant’s Fire Protection Program is described in SER Section 3.0.3.2.6. The staff’s evaluation of Fire Protection Program includes an assessment of the ability of the program elements to manage aging consistent with the program element recommendations in the corresponding GALL AMPs and of the exception and enhancements taken in the AMP. Based on this review, the staff finds that the applicant has created a valid basis for crediting its Fire Protection Program to manage loss of material in the fuel oil delivery lines to the diesel-driven fire protection pumps under exposure to the diesel fuel oil environment.

The staff noted that the applicant’s Diesel Fuel Oil Program is an existing plant-specific program for the VEGP LRA. The staff verified that the applicant credits it Diesel Fuel Oil Program to manage loss of material in the plant components that are exposed to diesel fuel oil and that the scope of the AMP includes the diesel fuel oil delivery systems for both the emergency diesel generators and the diesel engine-driven fire water pumps. With respect to the AMP’s program elements regarding the fuel oil delivery lines to the diesel-driven fire protection pumps the staff specifically verified that the VEGP Diesel Fuel Oil Program manages loss of material in the delivery lines through the visual inspections performed in accordance with the applicant’s Fire Protection Program. The staff’s evaluation of the applicant’s Diesel Fuel Oil Program is described in SER Section 3.0.3.2.6. The staff’s evaluation of the Diesel Fuel Oil Program includes an assessment of the ability of the program elements to manage aging consistent with the staff’s recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). Based on this review, the staff finds that the applicant has created a valid basis for crediting its Diesel Fuel Oil Program to manage loss of material in the component surfaces that are exposed to the diesel fuel oil environment.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant appropriately addressed the aging effect or mechanism as recommended by the GALL Report.

3.3.2.1.9 Loss of Material Due to General Corrosion

LRA Table 3.3.1, Item 3.3.1-73 provides the applicant's AMR for managing loss of material of steel crane structural girders in load handling system under exposure to an uncontrolled indoor air environment. In the AMR, the applicant credits its Overhead and Refueling Crane Inspection Program to manage loss of material due to general corrosion in these girders. During the audit and review, the staff noted the Type "2" AMR items pointing LRA Table 3.3.1, Item 3.3.1-73 were designated as being consistent with GALL under Note E.

The corresponding GALL AMR items are AMR Item 73 in Table 3 of the GALL Report, Volume 1 and AMR Item VII.B-3 in the GALL Report Volume 2 (GALL AMR VII.B-3). These GALL AMRs recommend that GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," be credited to manage loss of material due to general corrosion in the girder surfaces that are exposed to uncontrolled indoor air.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff verified that, consistent with the AMR recommendations in GALL, the applicant credited its Overhead and Refueling Crane Inspection Program to manage loss of material in the girder surfaces that are exposed to uncontrolled indoor. The staff verified that the Overhead and Refueling Crane Inspection Program is identified as an AMP that is entirely consistent with the program elements recommended in GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems," without exception, and that the scope of the applicant's program includes the crane bridge and trolley structural girders and beams and the crane rails and support girders within the scope of license renewal. The staff's evaluation of the Overhead and Refueling Crane Inspection Program is documented in SER Section 3.0.3.1.3. The staff's evaluation of Overhead and Refueling Crane Inspection Program includes an assessment of the ability of the program elements to manage aging consistent with the program element recommendations in GALL AMP XI.M23. Based on this review, the staff finds that the applicant has created a valid basis for crediting its Overhead and Refueling Crane Inspection Program to manage loss of material in these crane girders.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant appropriately addressed the aging effect or mechanism as recommended by the GALL Report.

3.3.2.1.10 Loss of Material Due to Pitting and Crevice Corrosion

LRA Table 3.3.1, Item 3.3.1-79 provides the applicant's AMR for managing loss of material due to pitting corrosion, crevice corrosion or fouling in stainless steel piping, piping components, piping elements, and system strainers in the turbine plant cooling water system under exposure to the raw water environment of the river water. In this AMR, the applicant credited its Piping and Duct Internal Inspection Program to manage loss of material in the component surfaces that are exposed internally to the river water. During the audit and review, the staff noted that the Type "2" AMR items pointing to LRA Table 3.3.1, Item 3.3.1-79 were designated as being consistent with GALL under Note E.

The corresponding GALL AMR items are AMR Item 79 in Table 3 of the GALL Report, Volume 1 and AMR Item VII.C1-15 in the GALL Report Volume 2 (GALL AMR VII.C1-15). These GALL AMRs recommend that GALL AMP XI.M20, “Open-Cycle Cooling Water System,” be credited to manage loss of material due to pitting corrosion, crevice corrosion or fouling in the piping, piping component, and piping element surfaces that are exposed to the raw water environment.

The staff reviewed the Type “2” AMR items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. However, the staff noted that, while the GALL Report recommends GALL AMP XI.M20, “Open-Cycle Cooling Water System,” the applicant credited its Piping and Duct Internal Inspection Program to manage loss of material in these stainless steel piping components.

The staff verified that the applicant’s Piping and Duct Internal Inspection Program is a new program for managing, in part, loss of material due to pitting corrosion in internal surfaces of piping and duct components that are not addressed by other aging management programs. The staff verified that the program has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, with exceptions. The staff also verified that like GALL AMP XI.M20, “Open-Cycle Cooling Water System,” the scope of the applicant’s program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant’s letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff’s evaluation of Piping and Duct Internal Inspection Program includes an assessment of the ability of the program elements to manage aging consistent with the program element recommendations in GALL AMP XI.M38 and of the exceptions taken in the AMP and the enhancement of the program to include LRA Commitment No. 19. The staff’s evaluation of the Piping and Duct Internal Inspection Program also includes the staff’s resolution of RAI 3.3-1/3.4-1 on justification for crediting programs like the Piping and Duct Internal Inspection Program and the External Surfaces Monitoring Program to manage cracking and changes in material properties for polymer or elastomer components. However, the staff noted this RAI is not relevant to the assessment of this AMR because it pertains to management of loss of material in stainless steel piping components.

Based on this review, the staff finds that the applicant has created a valid basis for crediting its Piping and Duct Internal Inspection Program to manage loss of material in the stainless steel piping components that are exposed to raw water. On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff also finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.3.2.1.11 Loss of Material Due to Pitting, Crevice, Galvanic, and Microbiologically Influenced Corrosion, and Fouling

LRA Table 3.3.1, Item 3.3.1-82 provides the applicant's AMR for managing loss of material in the copper alloy steam generator blowdown corrosion product monitor cooler shells and heads under exposure to an internal a raw water (river water) environment. In the AMR, the applicant credited its Periodic Surveillance and Preventive Maintenance Activities Program. During the audit and review, the staff noted that the Type "2" AMR item pointing to LRA Table 3.3.1, Item 3.3.1-82 was designated as being consistent with GALL under Note E.

The corresponding GALL AMR items are AMR Item 82 in Table 3 of the GALL Report, Volume 1 and AMR Item VII.C1-3 in the GALL Report Volume 2 (GALL AMR VII.C1-3). These GALL AMRs recommend that GALL AMP XI.M20, "Open-Cycle Cooling Water System," be credited to manage loss of material due to pitting corrosion, crevice corrosion, galvanic corrosion, microbiologically-influenced corrosion, or fouling in copper alloy heat exchanger surfaces in the service water system that are exposed to a raw water environment.

The staff reviewed the AMR result item referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. However, the staff noted that, while the GALL Report recommends GALL AMP XI.M20, "Open-Cycle Cooling Water System," the applicant credited its Periodic Surveillance and Preventive Maintenance Activities Program to manage loss of material in these corrosion product monitor shells and heads. The staff's evaluation of the Periodic Surveillance and Preventive Maintenance Activities Program is documented in SER Section 3.0.3.3.6.

The staff verified that the applicant's Periodic Surveillance and Preventive Maintenance Activities is an existing program that credited both existing and new periodic inspections and tests to manage the aging effects applicable to the components included in the program. The staff verified that the steam generator blowdown corrosion product monitor coolers are within the scope of the applicant's Periodic Surveillance and Preventive Maintenance Activities Program and that the Periodic Surveillance and Preventive Maintenance Activities Program credits either visual examinations or non-visual examination techniques to monitor for corrosion or fouling that occur in these components. The staff also verified that these corrosion product monitor coolers are cooled by raw water, but not by raw water that is categorized as essential service water (i.e, nuclear cooling service water) and thus, are not within the scope of the applicant's Generic Letter 89-13 Program (which is the applicant's counterpart to GALL AMP XI.M20). The staff finds this to be an acceptable approach to aging management because the methods are consistent with those recommended in GALL AMP XI.M20, and because the steam generator blowdown corrosion product monitor coolers are not within the scope of the applicant's Generic Letter 89-13 Program.

The staff's evaluation of the Periodic Surveillance and Preventive Maintenance Activities Program is documented in SER Section 3.0.3.3.6. The staff's evaluation of the Periodic Surveillance and Preventive Maintenance Activities Program includes an assessment of the ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). Based on this review, the staff finds that the applicant has created a valid basis for crediting its Periodic Surveillance and Preventive Maintenance Activities Program to manage loss of material in the steam generator blowdown corrosion product monitor cooler heads and shells that are exposed to the raw water environment.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.3.2.1.12 Loss of Material Due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, Fouling, and Lining/Coating Degradation

LRA Table 3.3.1, Item 3.3.1-76 provides the applicants AMR for managing loss of material for steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) in the nuclear service water cooling, turbine plant cooling water system, river intake structure system, potable and utility water systems, and sampling systems under exposure to an internal raw water – river water environment. In these AMRs, the applicant credits its Piping and Duct Internal Inspection Program to manage loss of material due to general corrosion, pitting corrosion, crevice corrosion, galvanic corrosion, microbiologically-influenced corrosion, fouling, or coating degradation. During the audit and review, the staff noted that the Type “2” AMR items pointing to LRA Table 3.3.1, Item 3.3.1-76 designated that the AMRs are consistent with GALL under Note E.

The corresponding GALL AMR items are AMR Item 76 in Table 3 of the GALL Report, Volume 1 and AMR Item VII.C1-19, VII.C3-10, and VII.H2-22 in the GALL Report Volume 2 (GALL AMRs VII.C1-19, VII.C3-10, and VII.H2-22). These GALL AMRs recommend that GALL AMP XI.M20, “Open-Cycle Cooling Water System,” be credited to manage loss of material due to general corrosion, pitting corrosion, crevice corrosion, galvanic corrosion, microbiologically-influenced corrosion, fouling, or coating degradation in piping, piping component, and piping element surfaces (with interior liners/coatings or with degraded liners/coatings) that are exposed to a raw water environment.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. However, the staff notes that, where the GALL Report recommends GALL AMP XI.M20, “Open-Cycle Cooling Water System,” the applicant credited its Piping and Duct Internal Inspection Program to manage the loss of material in the steel component surfaces that are exposed internally to a raw water environment. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13.

The staff verified that the applicant’s Piping and Duct Internal Inspection Program is a new program for managing, in part, loss of material due to pitting corrosion in internal surfaces of piping and duct components that are not addressed by other aging management programs. The staff verified that the program has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, with exceptions. The staff also verified that like GALL AMP XI.M20, “Open-Cycle Cooling Water System,” the scope of the applicant’s program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff's evaluation of Piping and Duct Internal Inspection Program includes an assessment of the ability of the program elements to manage aging consistent with the program element recommendations in GALL AMP XI.M38 and of the exceptions taken in the AMP and the enhancement of the program to include LRA Commitment No. 19. The staff's evaluation of the Piping and Duct Internal Inspection Program also includes the staff's resolution of RAI 3.3-1/3.4-1 on justification for crediting programs like the Piping and Duct Internal Inspection Program and the External Surfaces Monitoring Program to manage cracking and changes in material properties for polymer or elastomer components.

However, the staff noted this RAI is not relevant to the assessment of this AMR because it pertains to management of loss of material in steel piping, piping components, and piping elements.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

3.3.2.1.13 Loss of Material Due to Wear

The staff reviewed LRA Section 3.3.2.1.13 against the criteria in SRP-LR Section 3.3.2.2.13.

LRA Section 3.3.2.2.13 addresses loss of material due to wear in elastomer seals and components exposed to an air - indoor (uncontrolled) environment as an aging effect not applicable because auxiliary systems AMR results do not include elastomer seals exposed to any environment conducive to a loss of material due to wear. LRA Section 3.3.2.2.5 addresses aging management of elastomer degradation.

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 the aging effect is adequately managed.

On the basis that VEGP does not have elastomer seals and components exposed to any environment conductive to loss of material due to wear, the staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP.

Based on the programs identified above, the staff concludes that the applicant has provided an acceptable basis why the recommended criterion in SRP-LR Section 3.3.2.2.13 is not applicable to the VEGP LRA.

3.3.2.1.14 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 loss of material due to cladding breach for steel charging pump casings with stainless steel cladding exposed to borated water as an aging effect not applicable because auxiliary system AMR results do not include steel pump casings with stainless steel cladding exposed to borated water. VEGP normal charging pump casings are fabricated from stainless steel, not clad carbon steel.

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.

On the basis that VEGP does not have stainless steel clad pump casings exposed to any environment conductive to loss of material due to wear, the staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP.

Based on the programs identified above, the staff concludes that the applicant has provided an acceptable basis why the recommended criterion in SRP-LR Section 3.3.2.2.14 is not applicable to the VEGP LRA.

3.3.2.1.15 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.

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 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 their 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

In LRA Section 3.3.2.2, the applicant further evaluated aging management, as recommended by the GALL Report, for the auxiliary systems components and provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- reduction of heat transfer due to fouling
- cracking due to SCC
- cracking due to SCC 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 microbiologically-influenced corrosion
- loss of material due to general, pitting, crevice, and microbiologically-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 microbiologically-influenced corrosion
- loss of material due to wear
- loss of material due to cladding breach
- QA 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 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

SRP-LR Section 3.3.2.2.1 states that fatigue is a TLAA in accordance with the definition criteria for a TLAA in 10 CFR 54.3 and is to be evaluated for acceptance in accordance with the criteria that are described in 10 CFR 54.21(C)(1).

In LRA Section 3.3.2.2.1, the applicant stated that load handling members subjected to fatigue loading conditions such as crane runways are accounted for by design. The applicant stated that crane use is limited and the number of stress cycles experienced is low in terms of fatigue service life when considering the period of extended operation. Based on this clarification, the applicant stated that potential fatigue of the cranes is not a TLAA for the LRA.

On the basis that plant cranes are designed for a large number of stress cycles in industrial use, and the actual use of cranes in a nuclear power plant is low in terms of fatigue service when also considering the period of extended operation, the staff finds acceptable the applicant's evaluation that no TLAA for fatigue of load handling components is required at VEGP.

In Section 3.3.2.2.1 of the LRA, the applicant did identify metal fatigue of the piping in the auxiliary systems as an analysis that meets the definition of a TLAA in 10 CFR 54.3. The staff verified that the applicant included this TLAA in LRA Section 4.3.2, which addresses metal fatigue of non-ASME Code Class 1 piping system components. SER Section 4.3.2 documents the staff's review of the applicant's evaluation of this TLAA.

Based on this review, the staff finds that the applicant has provided an acceptable basis for identifying those auxiliary system components that within the scope of the applicant's TLAA on metal fatigue for VEPG non-Class 1 piping components

3.3.2.2.2 Reduction of Heat Transfer Due to Fouling

In LRA Section 3.3.2.2.2, the applicant addresses reduction of heat transfer due to fouling in stainless steel heat exchanger tubes exposed to treated water as an aging effect not applicable to VEGP, a PWR plant. Applicable items are found only in BWR spent fuel cooling and cleanup and reactor water cleanup systems.

SRP-LR Section 3.3.2.2.2 is the Section in NUREG-1800, Revision 1, that corresponds to LRA Section 3.3.2.2.2. In SRP-LR Section 3.3.2.2.2, the staff states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water and that the existing program relies on control of water chemistry to manage reduction of heat transfer due to fouling. However, the staff clarifies that control of water chemistry may be inadequate and that as a result, the GALL Report recommends that the effectiveness of the water chemistry control program should be verified to ensure that reduction of heat transfer due to fouling is not occurring. The staff states that a one-time inspection is an acceptable method to ensure that reduction of heat transfer is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2.

On the basis that the GALL Report Volume 2 items associated with this Table 1 line Item 3.3.1-3 apply to BWR plants only and the stainless steel heat exchanger tubes subject to reduction of heat transfer due to fouling are associated with the BWR systems spent fuel pool cooling and cleanup and reactor water cleanup, the staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP, a PWR plant.

On the basis that VEGP does not have any components from this group, the staff finds that this aging effect is not applicable to VEGP.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.3.2.2.3 against the following criteria in SRP-LR Section 3.3.2.2.3:

(1) LRA Section 3.3.2.2.3 addresses cracking due to SCC in stainless steel piping, piping components, and piping elements of the BWR standby liquid control system as an aging effect not applicable to VEGP, a PWR plant.

    SRP-LR Section 3.3.2.2.3 states that cracking due to SCC could occur in the stainless steel piping, piping components, and piping elements of the BWR standby liquid control system that are exposed to sodium pentaborate solution greater than 60 °C (140 °F).

    The staff noted that this line item is applicable to BWR standby liquid control system piping and components and; therefore, not applicable because VEGP is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type to VEGP, a PWR plant.

(2) LRA Section 3.3.2.2.3 addresses cracking due to SCC in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 140 °F in the BWR reactor coolant cleanup system as an aging effect not applicable to VEGP, a PWR plant.

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 staff noted that this line item is applicable to BWR standby liquid control system piping and components and; therefore, not applicable because VEGP is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type to VEGP, a PWR plant.

(3) LRA Section 3.3.2.2.3 addresses cracking due to SCC that may occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust as an aging effect that the Piping and Duct Internal Inspection Program will manage for stainless steel piping components.

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 the aging effect is adequately managed.

The staff noted that the plant-specific AMP proposed by the applicant is the Piping and Duct Internal Inspection Program. The staff reviewed the Piping and Duct Internal Inspection Program and determined that the aging effect of cracking will be adequately managed by using visual inspection techniques to inspect representative samples of diesel exhaust components. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff finds that this program includes activities that are adequate to manage cracking in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

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 concludes 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 criteria in SRP-LR Section 3.3.2.2.4:

(1) LRA Section 3.3.2.2.4 addresses cracking due to SCC in stainless steel PWR nonregenerative heat exchanger components exposed to borated water greater than 140 °F as an aging effect to be managed by the Water Chemistry Control Program and the One-Time Inspection Program.

SRP-LR Section 3.3.2.2.4 states that cracking due to SCC and cyclic loading may occur in stainless steel PWR nonregenerative 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.

The staff noted that the plant-specific AMP proposed by the applicant is the Water Chemistry Program and verified with the One-Time Inspection Program. The staff reviewed the Water Chemistry Program and the One-Time Inspection Program. The staff concludes that the aging effects of cracking and cyclic loading will be adequately managed by the Water Chemistry Program and its effectiveness will be adequately verified with the One-Time Inspection Program which specifies the performance of internal inspections. The staff's evaluation of the Water Chemistry Program is documented in SER Section 3.0.3.1.4. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The staff finds that these programs include activities are adequate to manage cracking and cyclic loading in stainless steel PWR non-regenerative heat exchanger components exposed to treated borated water.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(2) LRA Section 3.3.2.2.4 addresses cracking due to SCC in stainless steel PWR regenerative heat exchanger components exposed to borated water greater than 140 °F as an aging effect to be managed by the Water Chemistry Control Program and the One-Time Inspection Program.

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.

The staff reviewed LRA Section 3.3.2.2.4 which credits the Water Chemistry Control and the One-Time Inspection Programs in combination for managing cracking due to SCC and cyclic loading of stainless steel regenerative heat exchanger components. The staff concludes that the One-Time Inspection Program is being used to verify the effectiveness of the Water Chemistry Control Program to manage cracking for stainless steel regenerative heat exchanger components. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.4 by verifying the effectiveness of the Water Chemistry Control Program by one-time inspections.

LRA Table 3.3.1, Item 3.3.1-08, states that cracking of stainless steel regenerative heat exchanger components in the emergency core cooling and chemical and volume control and boron recycle systems exposed to treated borated water (>140 °F) is managed with a combination of the Water Chemistry Control and the One-Time Inspection Programs. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.3.1, Item 3.3.1-08 refer to Note E.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The GALL Report recommends using a combination of GALL AMP XI.M2, "Water Chemistry" and a plant-specific verification program. The applicant proposed using the Water Chemistry Control Program, which is consistent with GALL AMP XI.M2, with the One-Time Inspection Program as the verification program. The staff evaluations of the Water Chemistry Control and One-Time Inspection Programs are documented in SER Sections 3.0.3.1.4 and 3.0.3.1.2, respectively.

The One-Time Inspection Program uses one-time inspections to verify the effectiveness of the Water Chemistry Control Program. The staff confirmed that the emergency core cooling and chemical and volume control and boron recycle systems are included within the scope of the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Control Program to manage cracking. On the basis of the use of the one-time visual inspections in these systems, the staff finds the applicant's use of the Water Chemistry Control Program and One-Time Inspection Program to be acceptable because it is conformance with the SRP-LR and the GALL Report.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(3) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel high-pressure pump casings in a treated borated water environment in the chemical and volume control system as an aging effect not applicable because the high-pressure pumps in that system operate at temperatures below the SCC threshold and because these pumps are centrifugal (not positive-displacement) with no significant cyclic loading likely.

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 staff reviewed LRA Section 3.3.2.2.4 which states that cracking due to stress corrosion cracking and cyclic loading is not applicable to VEGP stainless steel high-pressure pump casings in a treated borated water environment in the chemical volume and control system. The staff noted that the normal operating temperatures for the VEGP stainless steel high pressure chemical volume and control system pumps are less than 140 °F. Thus, the operating temperature for these pump casings is less than the temperature threshold for initiation of SCC in stainless steel materials in Section IX of the GALL Report, Volume 2. Further, the staff noted that the pumps within the scope of license renewal are centrifugal pumps and are therefore not subject to cyclic loading stresses. On the basis of its review, the staff finds that the applicant has created a valid basis for concluding that cracking due to SCC or cyclical loading is not an aging effect requiring management for the VEGP high pressure stainless steel chemical volume and control system pumps because the pumps operate at temperature less than that used by the staff for initiation of SCC and because the pump casings are not subject to significant cyclical loading stresses.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(4) LRA Section 3.3.2.2.4 addresses cracking of high-strength closure bolting for chemical and volume control system bolting exposed to steam or water leakage as an aging effect not applicable because the auxiliary systems have no high-strength bolting. Certified material test reports for a sample population of A193 Gr. B7 bolting indicate that the actual yield strengths of this bolting material do not exceed 150 ksi. Plant-specific operating experience supports this indication.

The staff reviewed LRA Section 3.3.2.2.4 which states that cracking due to stress corrosion cracking and cyclic loading is not applicable to VEGP steel closure bolting in an air with steam or water leakage environment in the chemical volume and control system. The staff noted that the applicant states in LRA Section 3.3.2.2.4 that no high strength closure bolting is used in VEGP auxiliary systems. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.4 by confirming that the aging effects are not applicable because actual VEGP bolting material does not exceed 150 ksi yield strength (which is the threshold of high-strength steel bolting material) and that this aging effect is not applicable.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.4 criteria.

For those line items that apply to LRA Section 3.3.2.2.4, the staff concludes 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).

3.3.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.3.2.2.5 against the following criteria in SRP-LR Section 3.3.2.2.5:

(1) LRA Section 3.3.2.2.5 addresses hardening and loss of strength due to elastomer degradation of seals and components in heating, ventilation, and air conditioning (HVAC) systems as aging effects managed by the Periodic Surveillance and Preventive Maintenance Activities, the Piping and Duct Internal Inspection Program, or the External Surfaces Monitoring Program for HVAC components aligned with this summary item, The External Surfaces Monitoring Program will manage degradation of the external surfaces of ventilation system elastomer flexible connectors. The Periodic Surveillance and Preventive Maintenance Activities will manage degradation of elastomeric seals in the control room filter units. The Piping and Duct Internal Inspection Program will manage degradation of internal surfaces of ventilation system elastomer flexible connectors. Components aligned to this summary item as substitutes include the boric acid storage tank diaphragms, for which the Periodic Surveillance and Preventive Maintenance Activities will manage degradation of surfaces exposed to an air - indoor environment.

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 staff reviewed LRA Section 3.3.2.2.5 which addresses hardening and loss of strength due to elastomer degradation for HVAC components. The staff noted that instead of a plant-specific AMP recommended by the GALL Report, the applicant proposed the combination of three AMPs to manage the aging effects of hardening and loss of strength due to elastomer degradation of elastomer seals and components in air – indoor.

The AMPs proposed by the applicant are the Periodic Surveillance and Preventive Maintenance Activities (evaluated in SER Section 3.0.3.3.6), the Piping and Duct Internal Inspection Program (evaluated in SER Section 3.0.3.2.13), and the External Surfaces Monitoring Program (evaluated in SER Section 3.0.3.2.5).

The staff noted that the Periodic Surveillance and Preventive Maintenance Activities, the Piping and Duct Internal Inspection Program, and the External Surfaces Monitoring Program contain inspection activities for elastomeric components including determining whether degradation has occurred, by physical manipulation. For the External Surfaces Monitoring Program, the applicant will inspect accessible elastomer components routinely, and inaccessible components either during outages, or by remote means. For the Periodic Surveillance and Preventive Maintenance Activities, the applicant will inspect the boric acid storage tank diaphragm surfaces exposed to air. For the Piping and Duct Internal Inspection Program, the applicant will manage internal surfaces of ventilation system elastomer flexible connectors.

In RAI 3.3-1/3.4-1, the staff asked the applicant to justify how visual examinations alone credited in programs such as the External Surfaces Monitoring Program or the Piping and Duct Internal Inspection Program would be capable of detecting a crack or managing material property changes in elastomeric, plastic or polymeric components.

In the applicant's response to RAI 3.3-1/3.4-1 dated June 23, 2008, the applicant confirmed that programs crediting visual examinations of elastomeric or polymeric materials also credit tactile techniques in conjunction with visual examinations to monitor for indications that may be indicative of changes in the strength or hardness properties of materials, and that these tactile techniques include scratching the material surface to screen for waxy or chalky residues (which can be indicative of polymer breakdown), pressing the polymer to qualitatively evaluate resiliency, bending or folding the polymer to identify crazing (surface cracking) or whitening (which can be indicative of reduced bonding of the filler), and stretching to evaluate tear resistance. The staff finds these additional techniques to be acceptable because the applicant will not be relying solely on visual examinations alone as the basis for aging management, and because these tactile activities are physical monitoring techniques that are be capable of indicating a change in the hardness or strength properties of the elastomeric materials. RAI 3.3-1/3.4-1 is resolved with respect to managing changes in material properties for these elastomeric auxiliary system piping components.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(2) LRA Section 3.3.2.2.5 addresses loss of strength due to elastomer degradation of elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and purification systems as an aging effect to be managed by the Periodic Surveillance and Preventive Maintenance Activities for boric acid storage tank diaphragms aligned to this summary item as substitutes. VEGP has no have elastomer linings in the spent fuel pool cooling and purification system.

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.

The staff reviewed LRA Section 3.3.2.2.5 which addresses loss of strength due to elastomer degradation for spent fuel pool cooling and purification system component linings. The staff noted that instead of a plant-specific AMP recommended by the GALL Report, the applicant proposed the combination of two AMPs to manage the aging effects of hardening and loss of strength due to elastomer degradation of elastomer linings in treated water or borated water. The AMPs proposed by the applicant are the Periodic Surveillance and Preventive Maintenance Activities (evaluated in SER Section 3.0.3.3.6), and the Piping and Duct Internal Inspection Program (evaluated in SER Section 3.0.3.2.13). The staff also noted that although VEGP does not have spent fuel pool cooling and cleanup system components with elastomer linings, the boric acid storage tank diaphragms are evaluated with this summary item.

The staff noted that the Periodic Surveillance and Preventive Maintenance Activities and the Piping and Duct Internal Inspection Program both contain inspection activities for elastomeric components including determining whether degradation has occurred, by physical manipulation. For the Periodic Surveillance and Preventive Maintenance Activities, the applicant will inspect the boric acid storage tank diaphragm surfaces exposed to treated borated water. For the Piping and Duct Internal Inspection Program, the applicant will manage internal surfaces of ventilation system elastomer flexible connectors.

In RAI 3.3-1/3.4-1, the staff asked the applicant to justify how visual examinations alone credited in programs such as the External Surfaces Monitoring Program or the Piping and Duct Internal Inspection Program would be capable of detecting a crack or managing material property changes in elastomeric, plastic or polymeric components.

In the applicant's response to RAI 3.3-1/3.4-1 dated June 23, 2008, the applicant confirmed that programs crediting visual examinations of elastomeric/polymeric materials also credit tactile techniques in conjunction with visual examinations to monitor for indications that may be indicative of changes in the strength or hardness properties of materials, and that these tactile techniques include scratching the material surface to screen for waxy or chalky residues (which can be indicative of polymer breakdown), pressing the polymer to qualitatively evaluate resiliency, bending or folding the polymer to identify crazing (surface cracking) or whitening (which can be indicative of reduced bonding of the filler), and stretching to evaluate tear resistance. The staff finds these additional techniques to be acceptable because the applicant will not be relying solely on visual examinations alone as the basis for aging management, and because these tactile activities are physical monitoring techniques that are be capable of indicating a change in the hardness or strength properties of the elastomeric materials. RAI 3.3-1/3.4-1 is resolved with respect to managing changes in material properties for the elastomeric spent fuel cooling and cleanup system components.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

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 concludes 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 reduction of neutron-absorbing capacity and loss of material due to general corrosion in the neutron-absorbing sheets of spent fuel storage racks exposed to treated or borated water as aging effects not requiring management (reduction in neutron-absorbing capacity) for the Boron-Carbide materials and managed (loss of material due to corrosion) by the Water Chemistry Control Program for the aluminum cladding material. The aluminum cladding prevents contact of the Boron-Carbide materials with borated water. Additionally, industry and plant-specific operating experience show no degradation of Boral spent fuel storage racks exposed to borated water. The staff has evaluated both the Virgil C. Summer Nuclear Plant and the Brunswick Steam Electric Plant for the aging effect of "reduction of neutron-absorbing capacity." The safety evaluations (NUREG-1787 for Summer, NUREG-1856 for Brunswick) for license renewal report the aging effect as insignificant. The conclusion is that "reduction of neutron-absorbing capacity" for Boral requires no aging management but the Water Chemistry Program will continue to manage the aging effect of loss of material.

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 staff reviewed LRA Section 3.3.2.2.6 in which the applicant evaluated if a reduction of neutron-absorbing capacity might occur in the neutron-absorbing sheets of the spent fuel storage racks at VEGP due to general corrosion. The staff concludes that reduction of neutron-absorbing capacity is not an aging effect requiring management for the boron-carbide materials of the spent fuel storage racks at VEGP. The design of the spent fuel storage racks with aluminum cladding prevents contact of the boron-carbide materials with borated water. Historical industry and plant-specific operating experience does not indicate that degradation of boral spent fuel storage racks exposed to borated water occurs. On the basis that the aluminum cladding prevents contact of the boron-carbide materials with borated water, there is no operating experience indicating degradation of boral spent fuel storage racks occurs, and the staff has previously determined that reduction of neutron-absorbing capacity for boral does not require aging management, the staff concludes that reduction of neutron-absorbing capacity is not an aging effect requiring management at VEGP.

The staff reviewed the Water Chemistry Control Program which will control the quality of the spent fuel pool water to prevent the loss of material of the aluminum cladding and boron-carbide materials within. On the basis that the quality of the spent fuel pool water will be continuously maintained, the staff concludes that the Water Chemistry Control Program will adequately manage the aging effect of loss of material through the period of extended operation.

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 concludes 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 criteria in SRP-LR Section 3.3.2.2.7:

(1) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion for steel piping components, valves, and tanks in the reactor coolant pump oil collection system exposed to lubricating oil as an aging effect for which the GALL Report recommends one-time inspections to verify the effectiveness of the lubricating oil program for control of the lubricating oil environment and to evaluate the thickness of the lower portion of the reactor coolant pump oil collection tank. Steel piping components and tanks of the reactor coolant pump oil collection system are not exposed continuously to a lubricating oil environment maintained by the Oil Analysis Program so this program is not credited for managing loss of material for them. Instead, the One-Time Inspection Program will manage these components using visual or volumetric nondestructive examination techniques to inspect a representative sample of the internal surfaces for significant corrosion. In addition, the One-Time Inspection Program will evaluate the thickness of the lower portion of a representative sample of the reactor coolant pump oil collection tanks. The reactor coolant pump oil collection system is part of the RCS. LRA Section 3.1 presents AMR results for the reactor coolant oil collection system. Consistent with the GALL Report with exceptions, the Oil Analysis Program and the One-Time Inspection Program will manage auxiliary system steel piping and components exposed to lubricating oil.

    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 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. 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 staff reviewed the Oil Analysis Program and the One-Time Inspection Program and determined that the aging effect of loss of material due to general, pitting, and crevice corrosion in steel components exposed to lubricating oil will be effectively managed. The staff concludes that the One-Time Inspection Program is being used to verify the effectiveness of the Oil Analysis Program to manage loss of material due to general, pitting and crevice corrosion for steel components exposed to lubricating oil. In addition, the One-Time Inspection Program, as stated in LRA Section 3.3.2.2.7, determines the thickness of the lower portion of the reactor coolant pump oil collection tank. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.7 by verifying the effectiveness of the Oil Analysis Program by one-time inspections and using one-time inspections to determine the thickness of the reactor coolant pump oil collection tank. The staff's review of the Oil Analysis Program and the One-Time Inspection Program is documented in SER Sections 3.0.3.2.10 and 3.0.3.1.2, respectively.

LRA Table 3.3.1, Item 3.3.1-15, states that loss of material of steel reactor coolant pump oil collection components in the reactor coolant and connected lines system exposed to lubricating oil is managed with the One-Time Inspection Program. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.3.1, Item 3.3.1-15 refer to Note E.

The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The GALL Report recommends using a combination of GALL AMP XI.M39, "Lubricating Oil Analysis" and GALL AMP XI.M32, "One Time Inspection," as a verification program. The applicant proposed using only the One-Time Inspection Program. The staff evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2.

Steel piping components and tanks of the VEGP reactor coolant pump oil collection system are not continuously exposed to a lubricating oil environment that is maintained by the Oil Analysis Program. Therefore, the Oil Analysis Program is not required for managing the loss of material of these components. The reactor coolant pump oil collection components need only be monitored for potential aging effect by the One-Time Inspection Program. The One-Time Inspection Program will use visual or volumetric NDE techniques to inspect a representative sample of the internal surfaces to assure there is no significant corrosion. In addition, the One-Time Inspection Program will evaluate the thickness of the lower portion of a representative sample of the RCP oil collection tanks.

The staff confirmed that loss of material of the internal surfaces of carbon steel components (including thickness verification of tank bottom surfaces) in the RCP oil collection system is included within the scope of the One-Time Inspection Program. On the basis that these components are not continuously exposed to a lubricating oil environment that is maintained by the Oil Analysis Program, the staff finds the applicant's use of the One-Time Inspection Program alone acceptable to confirm that loss of material is not occurring or is occurring so slowly as to not affect the intended functions of these components.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(2) LRA Section 3.3.2.2.7 addresses loss of material in BWR reactor water cleanup and shutdown cooling systems as an aging effect not applicable to VEGP, a PWR plant.

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 reactor water cleanup and shutdown cooling systems exposed to treated water.

The staff finds acceptable the applicant's evaluation that this aging effect is not applicable to VEGP because VEGP is not a BWR-designed reactor.

(3) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in steel and stainless steel diesel exhaust piping components exposed to diesel exhaust as an aging effect to be managed by the Piping and Duct Internal Inspection Program.

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 the aging effect is adequately managed.

The staff reviewed LRA Section 3.3.2.2.7 which addresses loss of material due to general, pitting, and crevice corrosion in steel and stainless steel diesel exhaust components. The staff noted that the plant-specific AMP proposed by the applicant is the Piping and Duct Internal Inspection Program. The staff reviewed the Piping and Duct Internal Inspection Program and verified that the aging effect of loss material will be adequately managed by using visual inspection techniques to inspect representative samples of diesel exhaust components. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff finds that this program includes activities that are adequate to manage loss of material in steel and stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

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 concludes 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 due to general, pitting, crevice, and microbiologically-influenced corrosion for steel piping components buried in soil as aging effects to be managed, consistent with the GALL Report AMP with exceptions, by the Buried Piping and Tanks Inspection Program.

SRP-LR Section 3.3.2.2.8 states that loss of material due to general, pitting, and crevice corrosion, and microbiologically-influenced corrosion 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 microbiologically-influenced corrosion. 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 staff reviewed the Buried Piping and Tanks Inspection Program and verified that the applicant credits the program to manage loss of material in buried piping and tank components and the program's ability to detect aging effects. The staff also reviewed the plant operating experience relevant to the Buried Piping and Tanks Inspection Program and verified that the program credits inspections of the external surfaces of buried piping and tanks when the piping or tanks are excavated for maintenance or when the external component surfaces are exposed for any other reason. The staff verified that, prior to entering the period of extended operation, the applicant indicated that it will perform a review to determine if at least one opportunistic or focused inspection of buried piping and tanks has been performed within the ten year period prior to the period of extended operation, and if an inspection did not occur, a focused inspection will be performed prior to the period of extended operation. In addition, the staff also verified that the applicant indicated credited a focused inspection of buried piping and tanks to be performed within ten years after entering the period of extended operation, unless an evaluation determined that sufficient opportunistic and focused inspections have occurred during this time to demonstrate the ability of the underground coatings to protect the underground piping and tanks from degradation. The staff verified that this is consistent with staff's recommended aging management basis for buried pipes in the "detection of aging effects" program element in GALL AMP XI.M34, "Buried Piping and Tanks Inspection." Based on this review, the staff finds that the applicant has provided an acceptable basis for crediting its Buried Piping and Tanks Inspection Program to manage loss of material in these steel buried pipe and tanks components because it is consistent with the GALL Report.

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 concludes 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 criteria in SRP-LR Section 3.3.2.2.9:

(1) LRA Section 3.3.2.2.9 addresses loss of material due to general, pitting, crevice and microbiologically-influenced corrosion for steel piping components and tanks exposed to fuel oil as an aging effect which may occur at locations where contaminants accumulate and for which the GALL Report recommends a one-time inspection of selected components to verify the effectiveness of the fuel oil chemistry program. The LRA states that, consistent with the GALL Report, the plant-specific Diesel Fuel Oil Program will manage the aging effect in EDG system components, and that One-Time Inspection Program is credited to verify the program effectiveness Diesel Fuel Oil Program by inspecting selected components where contaminants may accumulate. The LRA states that, unlike the GALL Report AMP, the Diesel Fuel Oil Program and the Periodic Surveillance and Preventive Maintenance Activities will manage the aging effect in the EDG fuel oil storage tanks. The Periodic Surveillance and Preventive Maintenance Activities visually inspect these tanks periodically.

    SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, microbiologically-influenced corrosion, 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, microbiologically-influenced corrosion, 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 staff reviewed the Diesel Fuel Oil Program, One-Time Inspection Program and Periodic Surveillance and Preventive Maintenance Activities Program that the applicant proposes to use to manage aging effects of steel piping and tanks in fuel oil environments. The staff verified that the Diesel Fuel Oil Program is credited to maintain the fuel oil quality by testing new fuel oil to quality standards prior to introducing it into plant storage tanks. The staff verified that the program calls for periodic sampling and testing of the fuel oil storage tank diesel fuel inventory to test for water accumulation, biological organisms, and particulate-based sediments. The Diesel Fuel Oil Program has requirements to invoke corrective actions when the fuel oil condition is found to be out of tolerance with specifications. The staff verified that the applicant credits either its One-Time Inspection Program or its Periodic Surveillance and Preventive Maintenance Activities Program verify the Diesel Fuel Oil Program effectiveness. The staff verified that the crediting of the One-Time Inspection Program is consistent with the staff's guidance in SPR-LR Section 3.3.2.2.9, Item (1).

The staff verified that the Periodic Surveillance and Preventive Maintenance Activities Program is an acceptable program to verify the effectiveness of the Diesel Fuel Oil Program to manage loss of material in the buried storage tank components because the program credits visual inspections that will be performed periodically instead of one time basis and that will monitor for signs of corrosion in the tanks and degradation in the interior tank liner/coating surfaces.

The staff also verified that the LRA includes LRA Table 3.3.1, Item 3.3.1-20 and associated type "2" AMR lines items that point to SRP-LR Section 3.3.2.2.9, Item (2). Like SRP-LR Section 3.3.2.2.9, Item (1), the staff verified that in these AMR items, the applicant credits its Diesel Fuel Oil Program and either the One-Time Inspection Program or Periodic Surveillance and Preventive Maintenance Activities Program to verify the effectiveness of the Diesel Fuel Oil Program in managing loss of material in the interior buried piping and tank surfaces that are exposed to diesel fuel. The staff's evaluations of the Diesel Fuel Oil Program, One-Time Inspection Program and Periodic Surveillance and Preventive Maintenance Activities Program are documented in SER Sections 3.0.3.3.3, 3.0.3.1.2 and 3.0.3.3.6, respectively.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(2) LRA Section 3.3.2.2.9 addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion and fouling for steel heat exchanger components exposed to lubricating oil as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of the lube oil

program. Consistent with the GALL Report AMP with exceptions, the Oil Analysis Program will manage the aging effect and the One-Time Inspection Program will verify program effectiveness by inspecting selected components at susceptible locations.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, microbiologically-influenced corrosion, 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 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 staff reviewed LRA Section 3.3.2.2.9 which addresses loss of material due to general, pitting, and crevice corrosion, microbiologically-influenced corrosion, and fouling in steel heat exchanger components in lubricating oil. The staff verified that the applicant credits its Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion, microbiologically-influenced corrosion, and fouling may occur in steel heat exchanger components exposed to lubricating oil and its One-Time Inspection Program to verify the program effectiveness of its Oil Analysis Program in managing this aging effect. The staff reviewed the VEGP Oil Analysis Program and verified that the program is a mitigative program that is specifically designed to manage the effects of aging in plant components that are exposed to lubricating oil. The staff also verified that the VEGP One-Time Inspection Program includes visual inspection techniques to verify the effectiveness of the Oil Analysis Program. The staff's evaluation of the Oil Analysis Program is documented in SER Section 3.0.3.2.10. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. Based on this review, the staff finds that the applicant has provided a valid basis for managing loss of material in the heat exchanger components that are exposed to lubricating oil because it in conformance with the recommendation in SRP-LR Section 3.3.2.2.9, Item (2) and the AMRs in the GALL report that are invoked by this SRP-LR section.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

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 concludes 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 criteria in SRP-LR Section 3.3.2.2.10:

(1) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for elastomer lining or stainless steel cladding exposed to treated water or borated water by degradation as an aging effect not applicable because AMR results for the spent fuel pool cooling and purification system do not include elastomer-lined carbon steel components. Other GALL Report Volume 2 items in this summary item are for BWRs; VEGP is a Westinghouse PWR.

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 that are exposed to treated water and treated borated water if the cladding or lining is degraded.

The staff reviewed LRA Section 3.3.2.2.10. The staff verified that the stated SRP-LR guidance is applicable only to steel spent fuel cooling and cleanup system piping that are designed with interior elastomeric liners (i.e. PWR spent fuel cooling and cleanup systems) or interior stainless steel cladding (BWR spent fuel cooling and cleanup systems). The staff verified that the GALL AMRs invoked by this SRP-LR section for steel piping components with interior stainless steel cladding are applicable to BWR designed facilities only. Based on this assignment, the staff finds that the recommendation in SRP-LR 3.3.2.2.10, Item (1) for steel piping components with interior stainless steel cladding are not applicable to VEGP because VEGP is PWR.

The staff also verified that the recommended guidance in SRP-LR Section 3.3.2.2.10, Item (1), as it pertains to steel spent fuel cooling and cleanup system piping components with interior elastomeric liners is not applicable to the VEGP LRA because the VEGP design does not include any elastomer lined steel piping components that are exposed to either a treated water or borated treated water environment. On the basis of this review, the staff finds that the applicant does not need to meet or conform to the recommended criteria in SRP-LR Section 3.3.2.2.10, Item (1) because the criteria in the SRP-LR section are not applicable to the VEGP design.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(2) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in BWR spent fuel pool cooling and cleanup, reactor water cleanup, and shutdown cooling system piping exposed to treated water as an aging effect not applicable to VEGP, a PWR plant.

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 stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water.

The staff verified that the recommended criteria in SRP-LR Section 3.3.2.2.10, item (2) are applicable only to stainless steel piping components and steel piping components with interior stainless steel cladding that are located in BWR spent fuel pool cooling, reactor water cleanup, and shutdown cooling system. Based on this review, the staff finds that the applicant has provided an acceptable basis for concluding the recommended criteria in SRP-LR Section 3.3.2.2.10, Item (2) are not applicable to the VEGP LRA because the units at VEGP are Westinghouse designed PWRs.

(3) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for copper alloy HVAC components exposed to condensation as an aging effect for which the GALL Report recommends a plant-specific program. The External Surfaces Monitoring Program will manage loss of material due to condensation on exposed surfaces of copper alloy auxiliary system components. The Piping and Duct Internal Inspection Program will manage loss of material for copper alloy surfaces internal to auxiliary system components and exposed to condensation.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy heating, ventilation, and air conditioning (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 the aging effect is adequately managed.

The staff reviewed LRA Section 3.3.2.2.10. The staff noted that credited its External Surfaces Monitoring Program to manage loss of material in the external surfaces of copper alloy auxiliary system components that may be exposed to condensation and its to manage loss of material in the internal surfaces of copper alloy auxiliary system components that may be exposed to condensation. The staff reviewed the External Surfaces Monitoring Program and the Piping and Duct Internal Inspection Program and verified that both programs are GALL-based programs that are credited to managing loss of material in metal components that are exposed to atmospheric environments, including those air environments that might be result in condensation of the components. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.2.5. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff evaluations includes an assessment of the ability of the program to manage loss of material in the metal surfaces that are exposed to an air environment, including those air environments that may result in condensation on the component surfaces.

Based on this review, the staff finds that the applicant has provided an acceptable basis for managing loss of material in the copper alloy HVAC components that are exposed to a condensation environment because the External Surfaces Monitoring Programs and the Piping and Duct Internal Inspection Program are valid programs to credit for management of loss of material that may occur in metal auxiliary components that are exposed to a condensation environment.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(4) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for copper alloy piping components exposed to lubricating oil as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of the lubricating oil program. Consistent with the GALL Report AMP with exceptions, the Oil Analysis Program will manage the aging effect and the One-Time Inspection Program will verify program effectiveness by inspecting selected components at susceptible locations.

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 staff reviewed LRA Section 3.3.2.2.10, and the AMRs in the application that are based on this section. The staff verified that the applicant credits its Oil Analysis Program to manage loss of material in the copper alloy piping components that are exposed to lubricating oil and its One-Time Inspection Program to verify that the Oil Analysis Program is effective in managing loss of material in these copper alloy components. The staff concludes that the One-Time Inspection Program is being used to verify the effectiveness of the Oil Analysis Program to manage loss of material for copper alloy components exposed to lubricating oil.

On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10 by verifying the effectiveness of the Oil Analysis Program by one-time inspections. The staff's evaluation of the Oil Analysis Program and the One-Time Inspection Program is documented in SER Sections 3.0.3.2.10 and 3.0.3.1.2, respectively.

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 concludes 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).

(5) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for aluminum piping and stainless steel ducting components exposed to condensation as an aging effect to be managed by the External Surfaces Monitoring Program for stainless steel component surfaces and by the Bolting Integrity Program for stainless steel bolting. The Piping and Duct Internal Inspection Program will manage loss of material from stainless steel surfaces exposed to condensation for surfaces internal to HVAC and other components.

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 the aging effect is adequately managed.

The staff reviewed the External Surfaces Monitoring Program, Piping and Duct Internal Inspection Program and Bolting Integrity Program for which the applicant proposed to use to manage loss of material on exposed surfaces of stainless steel components. Depending on the component inspection location, the applicant will use either the External Surfaces Monitoring Program or Piping and Duct Internal Inspection Program. For stainless steel bolting exposed to condensation, the applicant will use the Bolting Integrity Program. The staff verified that all of these programs are based on corresponding programs that are provided in Section XI of the GALL Report, Volume 2, and that all three programs use visual inspection techniques to detect loss of material for stainless steel components.

However, the staff did note some inconsistencies with the AMR items in the application that are based on LRA Section 3.3.2.2.10, Item (5). During the audit and review, the staff noted that in LRA Table 3.3.2-6, on page 3.3-114, the AMR line item component closure bolting, material stainless steel in an air-indoor (exterior) (condensation) environment, aging effect loss of material, AMP Bolting Integrity Program, LRA Table 1, Item 3.3.1-27, GALL Report Item VII.F2-1, Note E; is shown twice. The staff asked the applicant to explain why the line item is shown twice since the component is identical and also the material, environment, aging effect and aging management program.

In its response letter of February 8, 2008, the applicant stated that the duplication of the line item in LRA Table 3.3.2-6, on page 3.3-114, was an error and one of the line items would be removed from LRA Table 3.3.2-6. The applicant also stated that the LRA will be amended to remove one of the duplicate AMR line items shown on LRA page 3.3-114. The staff verified that the applicant amended the LRA in a letter dated March 20, 2008.

The staff finds the applicant's response acceptable because the applicant amended the LRA to remove one of the duplicate AMR line items from the LRA. The evaluation of the use of the Bolting Integrity Program to manage loss of material for the closure bolting is provided below.

During the audit and review, the staff noted that in LRA Table 3.3.2-12, on page 3.3-159 for AMR component cooling coils (essential chilled water), material stainless steel in an air-indoor (exterior) (condensation) environment, aging effect loss of material, LRA Table 1, Item 3.3.1-27 and GALL Report Item VII.F2-1, a Note B is shown. GALL Report Volume 2 Item VII.F2-1 calls for a plant-specific AMP. The staff asked the applicant to explain why a Note B is shown, consistent with the GALL Report with AMP exceptions, instead of Note E; the GALL Report identifies a plant-specific AMP. The applicant has assigned the External Surfaces Monitoring Program to manage loss of material for this component.

In its response letter of February 8, 2008, the applicant stated that Note B for the AMR component cooling coils in LRA Table 3.3.2-12 on page 3.3-159 should be a Note E. Note E is appropriate because GALL Report Volume 2 Item VII.F2-1 that aligns with this AMR line item identifies a plant-specific AMP, while the AMP credited in the LRA, External Surfaces Monitoring Program, is a GALL Report AMP with exceptions. Since a different AMP is credited while the material, environment and aging effect are consistent with the GALL Report, a Note E should have been specified instead of a Note B. The applicant also stated that the LRA line item for this component will be amended to change the note from a B to an E. The staff verified that the applicant amended the LRA in a letter dated March 20, 2008.

The staff finds the applicant's response acceptable because the applicant amended the LRA AMR line item for this component to designate show the correct Note E, instead of B. The evaluation of the use of the External Surfaces Monitoring Program to manage loss of material for the cooling coils (essential chilled water) is provided below.

During the audit and review, the staff noted that in LRA Table 3.3.2-12 on page 3.3-160 for AMR component cooling coils (nuclear service cooling water), material stainless steel in an air-indoor (exterior) (condensation) environment, aging effect loss of material, LRA Table 1, Item 3.3.1-27 and GALL Report Item VII.F2-1, a Note B is shown. GALL Report Volume 2 Item VII.F2-1 calls for a plant-specific AMP. The staff asked the applicant to explain why a Note B is shown, consistent with the GALL Report with AMP exceptions, instead of Note E; the GALL Report identifies a plant-specific AMP. The applicant has assigned the External Surfaces Monitoring Program to manage loss of material for this component.

In its response dated February 8, 2008, the applicant stated that Note B for the AMR component cooling coils in LRA Table 3.3.2-12 on page 3.3-160 should be a Note E. Note E is appropriate because GALL Report Volume 2 Item VII.F2-1 that aligns with this AMR line item identifies a plant-specific AMP, while the AMP credited in the LRA, External Surfaces Monitoring Program, is a GALL Report AMP with exceptions. Since a different AMP is credited while the material, environment and aging effect are consistent with the GALL Report, a Note E should have been specified instead of a Note B. The applicant also stated that the LRA line item for this component will be amended to change the note from a B to an E. The staff verified that the applicant amended the LRA in a letter dated March 20, 2008.

The staff finds the applicant's response acceptable because the applicant amended the LRA AMR line item for this component designate the correct Note E, instead of B. The evaluation of the use of the External Surfaces Monitoring Program to manage loss of material for the cooling coils (nuclear service cooling water) is provided below.

LRA Table 3.3.1, Item 3.3.1-27 states that loss of material of stainless steel HVAC ducting and aluminum HVAC piping, piping components and piping elements in the nuclear service cooling water, auxiliary component cooling water, chemical and volume control and boron recycle, auxiliary building ventilation, and containment building ventilation systems exposed to condensation is managed with either the External Surfaces Monitoring Program, Piping and Duct Internal Inspection Program or the Bolting Integrity Program. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.3.1, Item 3.3.1-27, refer to Note E. The staff reviewed the AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. However, where the GALL Report recommends a plant-specific AMP, the applicant proposed the External Surfaces Monitoring Program, Piping and Duct Internal Inspection Program or the Bolting Integrity Program depending on the component location. The staff evaluations of the External Surfaces Monitoring Program, Piping and Duct Internal Inspection Program and Bolting Integrity Program are documented in SER Sections 3.0.3.2.5, 3.0.3.2.13, and 3.0.3.3.2, respectively.

The VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. On the basis of the periodic visual inspections of the piping, piping components, ducting, and other components to detect loss of material, the staff finds the applicant's use of the External Surfaces Monitoring Program for external component surfaces to be acceptable.

The VEGP Piping and Duct Inspection Program is a new program that, in part, will manage corrosion of steel, stainless steel, aluminum and copper alloy components. Components included within the scope of this program are not addressed by other VEGP aging management programs. The VEGP Piping and Duct Internal Inspection Program will monitor not only component surfaces through visual inspection, but may also use non-visual NDE techniques to monitor parameters such as wall thickness.

On the basis of the periodic visual and non-visual technique inspections of the piping, piping components, ducting, and other components to detect loss of material in these stainless steel and aluminum HVAC components, the staff finds the applicant’s use of the Piping and Duct Inspection Program acceptable because the .

The Bolting Integrity Program is a new plant-specific program to manage cracking, loss of material, and loss of preload in mechanical bolted closures. The VEGP Bolting Integrity Program applies to safety-related and nonsafety-related bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are addressed by the Reactor Vessel Head Closure Stud Program. Visual inspections are conducted to detect loss of preload resulting in joint leakage and to detect fastener degradation due to cracking or loss of material. On the basis of the periodic visual inspections of the closure bolting to detect loss of material, the staff finds the applicant’s use of the Bolting Integrity Program acceptable.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(6) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for copper alloy fire protection system piping components exposed to internal condensation as an aging effect not applicable because auxiliary system AMRs do not include copper alloy fire protection piping components exposed to an internal condensation environment.

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 staff reviewed LRA Section 3.3.2.2.10 which states that loss of material is not applicable to VEGP copper alloy fire protection system components exposed to internal condensation. The staff noted that the applicant states in LRA Section 3.3.2.2.10 that no copper alloy fire protection components exist at VEGP that are exposed to an internal condensation environment.

On the basis of its review, the staff finds that the applicant has provided an acceptable basis for concluding that the criteria of SRP-LR Section 3.3.2.2.10, Item (6) are not applicable to the VEGP LRA because the VEGP design does not include any copper alloy fire protection system components that are exposed to an internal condensation environment.

(7) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion for stainless steel piping components exposed to soil as an aging effect to be managed by the Buried Piping and Tanks Inspection Program.

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.

LRA Table 3.3.1, Item 3.3.1-29, states that loss of material due to pitting and crevice corrosion of stainless steel piping components exposed to soil is managed by the Buried Piping and Tanks Inspection Program. During the audit and review, the staff noted that the AMR result item pointing to LRA Table 3.3.1, Item 3.3.1-29, refers to Note E.

The staff reviewed the AMR result item referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. However, where the GALL Report recommends a plant-specific AMP, the applicant proposed the Buried Piping and Tanks Inspection Program. As a result of this determination, the staff reviewed the Buried Piping and Tanks Inspection Program in order to determine whether the program is a valid AMP to credit for the management of loss of material in buried stainless steel auxiliary system piping, piping components and piping elements. The staff noted the VEGP Buried Piping and Tanks Inspection Program is credited for buried stainless steel piping components in addition to buried steel piping components and tanks. The staff also noted that the program credits visual inspections of the external surfaces of these buried components when the soil or material around the pipe components is excavated for maintenance or when the surfaces are exposed for any other reason. The staff also verified that the program credits a focused inspection of stainless steel buried piping to be performed within ten (10) years after entering the period of extended operation, unless an evaluation determined that sufficient opportunistic and focused inspections have occurred during this time to demonstrate the ability of the underground coatings to protect the underground piping from degradation. The staff also verified that the scope of the program calls for the inspection results to be documented and retained.

The staff also noted that the program element aspects of the applicant's Buried Piping and Tanks Inspection Program (as discussed in the previous paragraph) are consistent with the program elements in GALL AMP XI.M34, "Buried Piping and Tanks Inspection," and that the applicant's crediting of this AMP for aging management is meets the staff's AMR recommendations in SRP-LR Section 3.3.2.2.10, Item (5), and in AMR items VII.C1-16, VII.C3-8, VII.G-20, VII.H1-7, and VIIH2-19 of the GALL Report, Volume 2. Based on this review, the staff finds that the applicant has provided an acceptable basis for crediting the Buried Piping and Tanks Inspection Program to manage loss of material due to pitting and crevice corrosion in stainless steel auxiliary system piping, piping components, and piping elements exposed to soil, because the program is a GALL-based program that is designed to perform for inspection-based condition monitoring of buried piping, piping components, and piping elements, and because the crediting of this AMPs satisfies the staff's recommendation that an AMP be evaluated and credited for aging management of loss of material in these components,

The staff's evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.2.2. On the basis of its review of the AMR result item as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(8) LRA Section 3.3.2.2.10 addresses loss of material for stainless steel piping components exposed to treated water and sodium pentaborate in BWR standby liquid control systems as an aging effect not applicable to VEGP, a PWR plant.

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 standby liquid control system exposed to sodium pentaborate solution.

The staff's recommendations in SRP-LR Section 3.3.2.2.10, Item (8) are only applicable to the management of loss of material in piping components of BWR standby liquid control systems that are exposed to borated water.

Based on this review, the staff finds that the applicant has provided an acceptable basis for concluding that the recommendations in SRP-LR Section 3.3.2.2.10, Item (8) are not applicable to the VEGP LRA, because the VEGP units are Westinghouse-design PWRs and are not BWR designed reactors.

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 concludes 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 loss of material for BWR standby liquid control, spent fuel pool cooling and cleanup, reactor water cleanup, and shutdown cooling system copper alloy piping components exposed to treated water as an aging effect not applicable to VEGP, a PWR plant.

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.

The staff's recommendations in SRP-LR Section 3.3.2.2.11 are only applicable to the management of loss of material in copper alloy piping components of BWR standby liquid control systems, spent fuel pool cooling and cleanup systems, reactor water cleanup systems, and shutdown cooling system that are exposed to treated water.

Based on this review, the staff finds that the applicant has provided an acceptable basis for concluding that the recommendations in SRP-LR Section 3.3.2.2.11 are not applicable to the VEGP LRA, because the VEGP units are Westinghouse-design PWRs and are not BWR designed reactors

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 criteria in SRP-LR Section 3.3.2.2.12:

(1) LRA Section 3.3.2.2.12 addresses loss of material due to pitting, crevice, and microbiologically-influenced corrosion for stainless steel, aluminum, and copper alloy piping components exposed to fuel oil as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of the fuel oil chemistry control program. The plant-specific Diesel Fuel Oil Program manages the aging effect for EDG system components. The One-Time Inspection Program verifies program effectiveness by inspecting selected components at susceptible locations. The Diesel Fuel Oil Program and the Fire Protection Program will manage the aging effect for copper alloy valve bodies in the fire protection fuel oil system.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and microbiologically-influenced corrosion 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 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.

LRA Table 3.3.1, Item 3.3.1-32 states that loss of material of stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil (except for copper alloy valve bodies in the fire protection fuel oil system) is managed by the Diesel Fuel Oil and One-Time Inspection Programs. Loss of material for copper alloy valve bodies in the fire protection fuel oil system is managed by the Diesel Fuel Oil and Fire Protection Programs. During the audit and review, the staff noted that the AMR result items pointing to LRA Table 3.3.1, Item 3.3.1-32 refer to Note E.

The staff reviewed these AMR result items referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff noted that the GALL Report recommends using a combination of GALL AMP XI.M30, “Fuel Oil Chemistry” and GALL AMP XI.M32, “One Time Inspection,” as a verification program. The staff noted that the applicant credits its Diesel Fuel Oil Program, which is a plant-specific program, to manage loss of material in the stainless steel, aluminum, and copper-alloy auxiliary system components that are exposed to diesel fuel oil and either its One-Time Inspection Program or Fire Protection Program to verify the effectiveness of the Diesel Fuel Oil Program in managing loss of material in the component surfaces that are exposed to diesel fuel oil.

The staff reviewed the Diesel Fuel Oil Program, One-Time Inspection Program and Fire Protection Program that the applicant proposes to use to manage aging effects of stainless steel, aluminum, and copper alloy piping in fuel oil environments. The staff noted that the Diesel Fuel Oil Program is credited and designed to maintain the quality of diesel fuel oil in the diesel fuel oil storage tanks by testing it to standards prior to introducing it into plant's diesel fuel oil storage tanks. The staff noted that the program also performs periodic diesel fuel oil quality testing of the existing fuel oil inventory for water impurity accumulation, biological organisms, and particulates and sediments and that the program has administrative applicant-imposed requirements to invoke corrective actions when the quality of the fuel oil is determined to be out of tolerance with the applicant's fuel oil testing standards. The staff noted that these tests are required through an administrative control program that is within the scope SSES Technical Specification No. 5.5.9. The staff finds this to be an acceptable program for managing loss of material in these diesel fuel oil system components because it is consistent with the staff's recommendations in AMR 32 of Table 3 in GALL, Volume 1 and because the program is required to be administratively controlled through Technical Specification No. 5.5.9

The staff verified that the applicant's One-Time Inspection Program is credited, in part, to confirm the effectiveness of the Diesel Fuel Oil Program in managing loss of material in these emergency diesel generator system components. The staff finds this to be an acceptable program for managing loss of material in these diesel fuel oil system components because it is consistent with the staff's recommendations in AMR 32 of Table 3 in GALL, Volume 1.

The staff noted that the applicant has credited its Fire Protection Program is an alternative program for verifying the effectiveness of the Diesel Fuel Oil Program for those copper alloy valve bodies in the fire protection fuel oil system because the applicant will implement visual inspections for aging effects will be performed while the fire pump diesel engine is running during fire suppression system pump tests. The staff finds that the greater periodicity of the visual inspections performed under the Fire Protection Program makes the program an acceptable alternative to the One-Time Inspection Program.

The staff's evaluations of Diesel Fuel Oil Program, One-Time Inspection Program, and Fire Protection Program are discussed in SER Sections 3.0.3.3.3, 3.0.3.1.2, and 3.0.3.2.6, respectively. On the basis of the requirements of the Diesel Fuel Oil Program, One-Time Inspection Program, and Fire Protection Program, the staff concludes these programs will adequately manage the loss of material aging effect of stainless steel, aluminum, and copper alloy piping that are exposed to diesel fuel oil environments through the period of extended operation.

On the basis of its review of the AMR result item as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

(2) LRA Section 3.3.2.2.12 addresses loss of material due to pitting, crevice, and microbiologically-influenced corrosion in stainless steel piping components exposed to lubricating oil as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of the lubricating oil program. Consistent with the GALL Report AMP with exceptions, the Oil Analysis Program and the One-Time Inspection Program will manage the aging effect.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting, crevice, and microbiologically-influenced corrosion 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 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 staff reviewed the Oil Analysis Program and the One-Time Inspection Program and determined that the aging effect of loss of material due to pitting, crevice, and microbiologically induced corrosion in stainless steel components exposed to lubricating oil will be effectively managed. The staff concludes that the One-Time Inspection Program is being used to verify the effectiveness of the Oil Analysis Program to manage loss of material due to pitting, crevice, and microbiologically induced corrosion for stainless steel components exposed to lubricating oil. The staff's evaluations of Oil Analysis Program and the One-Time Inspection Program are documented in SER Sections 3.0.3.2.10 and 3.0.3.1.2, respectively. On the basis of its review, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.12 by verifying the effectiveness of the Oil Analysis Program by one-time inspections.

On the basis of its review of the AMR result items as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect or mechanism appropriately as recommended by the GALL Report.

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 concludes 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 loss of material due to wear in elastomer seals and components exposed to an air - indoor (uncontrolled) environment as an aging effect not applicable because auxiliary systems AMR results do not include elastomer seals exposed to any environment conducive to a loss of material due to wear. LRA Section 3.3.2.2.5 addresses aging management of elastomer degradation.

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 the aging effect is adequately managed.

On the basis that VEGP does not have elastomer seals and components exposed to any environment conductive to loss of material due to wear, the staff finds acceptable the applicant’s evaluation that this aging effect is not applicable to VEGP.

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 loss of material due to cladding breach for steel charging pump casings with stainless steel cladding exposed to borated water as an aging effect not applicable because auxiliary system AMR results do not include steel pump casings with stainless steel cladding exposed to borated water. VEGP normal charging pump casings are fabricated from stainless steel, not clad carbon steel.

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.

On the basis that VEGP does not have stainless steel clad pump casings exposed to any environment conductive to loss of material due to wear, the staff finds acceptable the applicant’s evaluation that this aging effect is not applicable to VEGP.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.14 criteria. The staff concludes 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).

3.3.2.2.15 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.

3.3.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.3.2-1 through 3.3.2-32, 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 3.3.2-1 through 3.3.2-32, 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.

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 Fuel Storage Racks: New and Spent Fuel - Summary of Aging Management Review – LRA Table 3.3.2-1

The staff reviewed LRA Table 3.3.2-1, which summarizes the results of AMR evaluations for the fuel storage racks: new and spent fuel component groups.

In LRA Table 3.3.2-1, the applicant proposed to manage the loss of material for boral spent fuel storage racks exposed to an exterior borated water environment using the Water Chemistry Control Program.

However, where the GALL Report Volume 2 for this component, material, environment, aging effect combination recommends a plant-specific AMP, the applicant proposed the Water Chemistry Control Program. The staff's evaluation of the Water Chemistry Control Program is documented in SER Section 3.0.3.1.4. The Water Chemistry Control Program description states that it is an existing program that mitigates loss of material, cracking, and reduction in heat transfer in system components and structures through the control of water chemistry. The program includes control of detrimental chemical species and the addition of chemical agents. This program is consistent with GALL AMP XI.M2, "Water Chemistry." The staff reviewed the Water Chemistry Control Program which will control the quality of the spent fuel pool borated water to prevent the loss of material of the aluminum cladding for the boral spent fuel storage racks and boron-carbide materials within. On the basis that the quality of the borated spent fuel pool water will be continuously maintained, the staff concludes that the Water Chemistry Control Program will adequately manage the aging effect of loss of material through the period of extended operation. On the basis of its review, the staff finds that the aging effect of loss of material for boral spent fuel storage racks exposed to an exterior borated water environment will be effectively managed by the Water Chemistry Control Program.

The applicant assigned a Note I, aging effect in the GALL Report for this component, material, and environment combination is not applicable, to this AMR line item because the GALL Report aging effects associated with this component, material and environment combination under GALL Report Volume 2 line Item VII.A2-5 are reduction of neutron-absorbing capacity and loss of material. The applicant's AMR of this component determined that reduction of neutron absorbing capacity was not an aging effect requiring management and therefore assigned the Note I to this LRA AMR line item.

The staff's review of LRA Section 3.3.2.2.6 in which the applicant evaluated if a reduction of neutron-absorbing capacity might occur in the neutron-absorbing sheets of the spent fuel storage racks at VEGP due to general corrosion is documented in SER Section 3.3.2.2.6. The staff concludes that reduction of neutron-absorbing capacity is not an aging effect requiring management for the boron-carbide materials of the spent fuel storage racks at VEGP.

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 Spent Fuel Pool Cooling and Purification System: Summary of Aging Management Review – LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of AMR evaluations for the spent fuel pool cooling and purification system component groups.

In LRA Table 3.3.2-2, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]).

On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity 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).

3.3.2.3.4 Nuclear Service Cooling Water Systems: Summary of Aging Management Review – LRA Table 3.3.2-4

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material for either carbon steel or stainless steel closure bolting exposed to an external environment of air subject to being wetted with raw water, using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of material of either carbon steel or stainless steel closure bolting exposed to an external environment of air subject to being wetted with raw water will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of preload for either carbon steel or stainless steel closure bolting exposed to either an external air (outdoor or indoor) environment or external environment of raw water using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]).

On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of carbon steel closure bolting exposed to either an external air (outdoor or indoor) environment or external environment of raw water will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-4, the applicant proposed to manage cracking for stainless steel closure bolting exposed to an external environment of air (outdoor) subject to being wetted with raw water, using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of cracking of stainless steel closure bolting exposed to an external environment of air (outdoor) subject to being wetted with raw water will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material for nickel alloy piping components exposed to an external environment of air (indoor) with condensation, using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material for nickel alloy piping components exposed to an external environment of air (indoor) with condensation will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-4, the applicant proposed to manage change in material property (cracking) for PVC piping components exposed to an internal environment of air (indoor) or external environment of air (outdoor), using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of change in material property (cracking) for PVC piping components exposed to an internal environment of air (indoor) or external environment of air (outdoor) will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-4, the applicant proposed to manage change in material property (cracking) for PVC piping components exposed to an internal environment of drainage (dirty) or an internal environment of raw water, using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2 The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the nuclear service cooling water system within the scope of the One-Time Inspection Program to confirm that the aging effect of change in material property (cracking) in an interior environment for PVC piping components exposed to an internal environment of drainage (dirty) is managed. On the basis of its review, the staff finds that the aging effect of change in material property (cracking) for PVC piping components exposed to an interior drainage (dirty) environment or an internal environment of raw water will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-4, the applicant stated that PVC piping components exposed either to an external soil environment or an interior treated water environment do not exhibit any aging effects requiring management. PVC, unlike metals, do not display corrosion rates and depend on chemical resistance to the environment to which they are exposed. On this basis, the staff finds that PVC piping components, exposed either to an external soil environment or interior treated water environment exhibit no aging effects, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-4, the applicant stated that stainless steel piping components, pump casings, flow orifices/elements and valve bodies exposed to either an internal air (indoor and outdoor) environment or an external air (outdoor) environment do not exhibit any aging effects requiring management. The staff finds this acceptable because stainless steel is highly resistant to corrosion in dry air in the absence of corrosive species, as cited in the Metals Handbook, Volume 3 (p. 65) and Volume 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Therefore, stainless steel in an internal air (indoor and outdoor) environment or an external air (outdoor) environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-4, the applicant proposed to manage loss of material for stainless steel piping components, pump casings, flow orifice/elements and valve bodies, carbon steel piping components and valve bodies or copper alloy spray nozzles, oil coolers and piping components exposed to an external environment of air subject to being wetted with raw water, using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material for stainless steel piping components, pump casings, flow orifice/elements and valve bodies, carbon steel piping components and valve bodies or copper alloy spray nozzles, oil coolers and piping components exposed to an external environment of air (outdoor) subject to being wetted with raw water will be effectively managed by the External Surfaces Monitoring Program.

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of AMR evaluations for the nuclear service cooling water systems component groups.

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).

3.3.2.3.5 Component Cooling Water System: Summary of Aging Management Review – LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of AMR evaluations for the component cooling water system component groups.

During the audit and review, the staff noted that in LRA Table 3.3.2-5,on page 3.3-106, the AMR line item component closure bolting, material stainless steel in an air-indoor (exterior) environment, aging effect loss of preload, AMP Bolting Integrity Program, LRA Table 1 none, GALL Report item none, Note H, is shown twice. The staff asked the applicant to explain why the line item is shown twice since the component is identical and also the material, environment, aging effect and aging management program.

The applicant provided its response to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the duplication of the line item in LRA Table 3.3.2-5 on page 3.3-106 was an error and one of the line items would be removed from LRA Table 3.3.2-5.

The applicant also stated that the LRA will be amended to remove one of the duplicate AMR line items shown on LRA page 3.3-106. The staff confirmed that the applicant amended the LRA in a letter dated March 20, 2008.

The staff finds the applicant's response acceptable since one of the duplicate AMR line items for this component will be removed from the LRA. The evaluation of the use of the

Bolting Integrity Program to manage loss of preload for the closure bolting is provided below.

In LRA Table 3.3.2-5, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant’s Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant’s Reactor Vessel Head Closure Stud Program. The staff’s evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff’s evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff’s recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-5, the applicant proposed to manage the loss of material for carbon steel shells of CCW pump motor coolers exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff’s evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the component cooling water system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel shells of CCW pump motor coolers exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

During the audit and review, the staff noted that in LRA Table 3.3.2-5 on page 3.3-109, the AMR line item component CCW pump motor cooler tubesheets is exposed to an exterior air-ventilation environment. The staff asked the applicant to explain how these tubesheets are exposed to an air-ventilation environment.

The applicant provided its response to the staff’s question in a letter dated February 8, 2008. In its response, the applicant stated that the CCW pump motors are totally-enclosed water-cooled motors. Each motor is cooled by recirculating internal air through a heat exchanger which in turn is cooled by nuclear service cooling water. Fans internal to the motor circulate the air through the rotor and stator and through the heat exchanger in a closed recirculating loop. The heat exchanger is provided with condensate drains and because the air is recirculated through the cooler and is dehumidified by draining off any moisture that condenses on the heat exchanger tubes, the air internal to the heat exchanger is considered to be air-ventilation.

The staff finds the applicant's response acceptable because it adequately clarifies how the CCW pump motor tubesheets are exposed to an air-ventilation environment. The evaluation of the applicant's declaration that copper alloy tubesheets of CCW pump motor coolers exposed to an exterior air-ventilation environment do not exhibit any aging effects requiring management is provided below.

In LRA Table 3.3.2-5, the applicant stated that copper alloy tubesheets of CCW pump motor coolers exposed to an exterior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item SP-6 for steam and power conversion systems which applies to copper alloy piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for copper alloy piping, piping components, and piping elements exposed to indoor uncontrolled air which is either the same or a more aggressive environment than the exterior air-ventilation environment for this copper alloy line item, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that copper alloy tubesheets of CCW pump motor coolers exposed to an exterior air-ventilation environment do not exhibit aging effects requiring management.

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 Auxiliary Component Cooling Water System: Summary of Aging Management Review – LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the auxiliary component cooling water system component groups.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external air (indoor) environment using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity

Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e.; in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external air (indoor) environment will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-6, the applicant proposed to manage cracking for carbon steel piping components (including startup strainer spools), pump casings, heat exchanger shells and tubesheets, ACCW pump motor cooler channel heads, tanks (chemical addition and surge), and valve bodies in the auxiliary component cooling water system exposed to an internal environment of closed-cycle cooling water using the ACCW System Carbon Steel Components Program.

The staff's evaluation of the ACCW System Carbon Steel Component Program which is a new plant-specific program is documented in SER Section 3.0.3.3.1. The ACCW System Carbon Steel Component Program description states that periodic visual inspections and leakage monitoring of carbon steel components exposed to auxiliary component cooling water are performed. The program is in response to VEGP operating experience related to nitrite induced SCC leading to subsequent component leakage. The program includes periodic and routine walkdowns performed by qualified personnel and continuous system leak detection. The leak detection includes monitoring for ACCW surge tank low-level conditions which is an alarmed function. On the basis of its review, the staff finds that because these components will be inspected periodically, and that leak detection is continuously performed, the aging effect of cracking for carbon steel piping components (including startup strainer spools), pump casings, heat exchanger shells and tubesheets, ACCW pump motor cooler channel heads, tanks (chemical addition and surge), and valve bodies exposed to an internal environment of closed-cycle cooling water will be effectively managed by the ACCW System Carbon Steel Component Program.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of material for stainless steel flow orifice/elements exposed to an external environment of air with condensation, using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material for stainless steel flow orifice/elements exposed to an external environment of air with condensation will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-6, the applicant stated that copper alloy ACCW pump motor cooler tubes and tubesheets exposed to an air (exterior) environment do not exhibit any aging effects requiring management. The staff finds this acceptable because the GALL Report does not identify any aging effects requiring management for copper alloy less than 15 percent Zn component types exposed to air with borated water leakage which is a more aggressive environment than the air (exterior) environment in these line items. Therefore, copper alloy in an air (exterior) environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

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 River Intake Structure System: Summary of Aging Management Review – LRA Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the river intake structure system component groups.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of material for carbon steel closure bolting exposed to an external environment of outdoor air (wetted) using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of material of carbon steel closure bolting exposed to an external environment of outdoor air (wetted) will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of preload for carbon steel closure bolting exposed to an external environment of air-outdoor using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of carbon steel closure bolting exposed to an external environment of air-outdoor will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-8, the applicant proposed to manage loss of material for carbon steel piping components and valve bodies exposed to an external environment of outdoor air (wetted) using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material for carbon steel piping components and valve bodies exposed to an external environment of outdoor air (wetted) will be effectively managed by the External Surfaces Monitoring 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).

3.3.2.3.9 Compressed Air Systems: Summary of Aging Management Review – LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of AMR evaluations for the compressed air systems component groups.

In LRA Table 3.3.2-9, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external air (indoor) environment using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external air (indoor) environment will be effectively managed by the Bolting Integrity 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).

3.3.2.3.10 Chemical and Volume Control and Boron Recycle Systems: Summary of Aging Management Review – LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the chemical and volume control boron recycle systems component groups.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-10, the applicant proposed to manage cracking for carbon steel shells of excess letdown, letdown chiller, letdown, and seal water heat exchangers exposed to an internal environment of closed cycle cooling water from the Auxiliary Component Cooling Water System (ACCW) using the ACCW System Carbon Steel Components Program.

The staff's evaluation of the ACCW System Carbon Steel Components Program is documented in SER Section 3.0.3.3.1. The ACCW System Carbon Steel Components Program description states cracking of carbon steel components exposed to auxiliary component cooling water is managed through a combination of leakage monitoring, routine walkdowns and periodic visual inspections. The program is in response to operating experience related to nitrite induced stress corrosion cracking (SCC) and subsequent component leakage in the VEGP ACCW system components. This program is a plant-specific program. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of cracking for carbon steel shells of excess letdown, letdown chiller, letdown, and seal water heat exchangers exposed to an internal environment of closed cycle cooling water from the ACCW system will be effectively managed by the ACCW System Carbon Steel Components Program.

In LRA Table 3.3.2-10, the applicant proposed to manage loss of material from erosion for stainless steel letdown orifices and piping components exposed to an internal environment of borated water with a high differential pressure using the Inservice Inspection Program.

The staff's evaluation of the Inservice Inspection Program is documented in SER Section 3.0.3.3.4. The Inservice Inspection Program description states the program manages cracking, loss of material, loss of preload, and loss of fracture toughness in components crediting the program. The program uses periodic visual, surface, and volumetric examination and leakage tests of Class 1, 2 and 3 pressure-retaining components, their integral attachments, and supports to detect and characterize flaws. VT-1 visual examinations are used to detect discontinuities and imperfections on the surfaces of components, including such conditions as cracks, wear, corrosion, or erosion. This program is a plant-specific program. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material form erosion for stainless steel letdown orifices and piping components exposed to an internal environment of borated water with a high differential pressure will be effectively managed by using the Inservice Inspection Program.

In LRA Table 3.3.2-10, the applicant proposed to manage the loss of material for carbon steel shells of normal charging pump motor coolers exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the chemical and volume control and boron recycle system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment.

On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel shells of normal charging pumps motor coolers exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-10, the applicant proposed to manage cracking for carbon steel piping components and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW using the ACCW System Carbon Steel Components Program.

The staff's evaluation of the ACCW System Carbon Steel Components Program is documented in SER Section 3.0.3.3.1. The ACCW System Carbon Steel Components Program description states cracking of carbon steel components exposed to auxiliary component cooling water is managed through a combination of leakage monitoring, routine walkdowns and periodic visual inspections. The program is in response to operating experience related to nitrite induced SCC and subsequent component leakage in the VEGP ACCW system components. This program is a plant-specific program. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of cracking for carbon steel piping components and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW system will be effectively managed by the ACCW System Carbon Steel Components Program.

In LRA Table 3.3.2-10, the applicant proposed to manage change in material properties, for which the applicant includes cracking, for PVC pump casings of zinc addition injection pumps exposed to an external environment of indoor air using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of change in material properties for PVC pump casings of zinc addition injection pumps exposed to an external environment of indoor air will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-10, the applicant stated that PVC pump casings of zinc addition injection pumps exposed to an interior treated water environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. The staff finds this acceptable because there is no indication in the industry that PVC or thermoplastics exposed to a treated water internal environment have any aging effects requiring management. The generally low operating temperatures and historical good chemical resistance data for PVC components, combined with a lack of historic negative operating experience, indicate that PVC is not likely to experience any degradation from the treatment chemicals used in the water. PVC materials do not display corrosion rates as metals do, but rather rely on chemical resistance to the environments to which they are exposed. Therefore, based on industry experience and the assumption of proper design and application of the material, the staff finds that PVC pump casings of zinc addition injection pumps exposed to an interior treated water environment exhibit no aging effects requiring management for the period of extended operation.

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 Ventilation Systems - Control Building (CB): Summary of Aging Management Review – LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of AMR evaluations for the ventilation systems - control building (CB) component groups.

In LRA Table 3.3.2-11, the applicant proposed to manage the loss of material for carbon steel damper housings, duct silencer housings, fan housings, and heater housings exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the control building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the aging management of loss material for carbon steel exposed to an air/gas environment in a control room ventilation system by the One-Time Inspection Program has been previously accepted by the staff in other LRA reviews. The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel damper housings, duct silencer housings, fan housings, and heater housings exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-11, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external air (indoor) environment using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external air (indoor) environment will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-11, the applicant stated that stainless steel control room filter, fan unit housings, and ductwork, fittings in the control building ventilation system exposed to an internal air-ventilation environment do not exhibit any aging effects requiring management. The staff finds this acceptable because stainless steel is highly resistant to corrosion in dry air in the absence of corrosive species, as cited in the Metals Handbook, Volume 3 (p. 65) and Volume 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Therefore, stainless steel in an internal air-ventilation environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-11, the applicant stated that fiber, foam and ceramic control room filter and fan unit moisture eliminators exposed to an exterior ventilation-air environment do not exhibit aging effects requiring management. The applicant stated that there has never been any plant-specific aging effect noted for these components. The staff's review of site operating experience did not identify any aging effects for these components at VEGP. On the basis of its review of current industry research and current plant operating experience, the staff concludes that fiber, foam and ceramic control room filter and fan unit moisture eliminators exposed to an exterior ventilation-air environment at VEGP do not exhibit aging effects requiring management.

In LRA Table 3.3.2-11, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System", the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. On the basis of its review, the staff finds that the aging effect change in material properties, for which the applicant includes hardening, loss of strength and cracking for elastomer flexible connectors exposed to an interior air-ventilation environment will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-11, the applicant proposed to manage the loss of material for carbon steel piping components exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The staff's evaluation described in SER Section 3.0.3.2.13 includes the staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to elastomeric components in the auxiliary systems. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the control building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-11, the applicant stated that copper alloy piping components exposed to an internal air-ventilation environment do not exhibit any aging effects requiring management. The staff finds this acceptable because the GALL Report does not identify any aging effects requiring management for copper alloy less than 15 percent Zn component types exposed to air with borated water leakage which is a more aggressive environment than the air (exterior) environment in these line items. Therefore, copper alloy in an internal air-ventilation environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

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 Ventilation Systems - Auxiliary Building (AB): Summary of Aging Management Review – LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the ventilation systems - auxiliary building (AB) component groups.

In LRA Table 3.3.2-12, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-12, the applicant proposed to manage the loss of material for carbon steel damper housings, fan housings, piping penetration area cooler housings, piping penetration filter and fan unit housings, and room cooler housings exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the auxiliary building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel damper housings, fan housings, piping penetration area cooler housings, piping penetration filter and fan unit housings, and room cooler housings exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-12, the applicant stated that stainless steel ductwork and fittings and piping penetration filter and fan unit housings exposed to an interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior air-ventilation environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The inside environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment for the stainless steel ductwork and fittings and piping penetration filter and fan unit housings components at VEGP. Therefore, the staff concludes that stainless steel ductwork and fittings and piping penetration filter and fan unit housings exposed to an interior air-ventilation environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-12, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System", the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. On the basis of its review, the staff finds that the aging effect change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-12, the applicant proposed to manage the loss of material for carbon steel piping components exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The staff's evaluation described in SER Section 3.0.3.2.13 includes the staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to elastomeric components in the auxiliary systems. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the control building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-12, the applicant stated that copper alloy piping components exposed to an interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item SP-6 for steam and power conversion systems which applies to copper alloy piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for copper alloy piping, piping components, and piping elements exposed to indoor uncontrolled air which is either the same or a more aggressive environment than the interior air-ventilation environment for this copper alloy line item, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that copper alloy piping components exposed to an interior air-ventilation environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-12, the applicant stated that fiber, foam and ceramic piping penetration

filter and fan unit moisture eliminators exposed to an exterior ventilation-air environment do not exhibit aging effects requiring management. The applicant stated that there has never been any plant-specific aging effect noted for these components. The staff's review of site operating experience did not identify any aging effects for these components at VEGP. On the basis of its review of current industry research and current plant operating experience, the staff concludes that fiber, foam and ceramic piping penetration filter and fan unit moisture eliminators exposed to an exterior ventilation-air environment at VEGP do not exhibit aging effects requiring management.
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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 Ventilation Systems - Containment Building (CTB): Summary of Aging Management Review – LRA Table 3.3.2-13

The staff reviewed LRA Table 3.3.2-13, which summarizes the results of AMR evaluations for the ventilation systems - containment building (CTB) component groups.

In LRA Table 3.3.2-13, the applicant proposed to manage the loss of material for carbon steel containment building auxiliary cooling unit housings, damper housings, duct silencer housings, fan housings, and heater housings exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the containment building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel containment building auxiliary cooling unit housings, damper housings, duct silencer housings, fan housings, and heater housings exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-13, the applicant stated that stainless steel fan housings, flexible connectors, flow orifice/element, piping components, and valve bodies in the containment building ventilation system exposed to an internal air-ventilation environment do not exhibit any aging effects requiring management. The staff finds this acceptable because stainless steel is highly resistant to corrosion in dry air in the absence of corrosive species, as cited in the Metals Handbook, Volume 3 (p. 65) and Volume 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Therefore, stainless steel in an internal air-ventilation environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-13, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment using the Piping and Duct Internal Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The staff's evaluation described in SER Section 3.0.3.2.13 includes the staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to elastomeric components in the auxiliary systems. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the control building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-13, the applicant proposed to manage the loss of material for carbon steel piping components exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the containment building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior clean drainage environment will be effectively managed by 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).

3.3.2.3.14 Ventilation Systems - Fuel Handling Building (FHB): Summary of Aging Management Review – LRA Table 3.3.2-14

The staff reviewed LRA Table 3.3.2-14, which summarizes the results of AMR evaluations for the ventilation systems - fuel handling building (FHB) component groups.

In LRA Table 3.3.2-14, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-14, the applicant proposed to manage the loss of material for carbon steel damper housings, fan housings, and FHB post accident filter and fan unit housings exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The staff's evaluation described in SER Section 3.0.3.2.13 includes the staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to elastomeric components in the auxiliary systems. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the control building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-14, the applicant stated that stainless steel ductwork and fittings, FHB post accident filter and fan unit housings, and valve bodies exposed to an interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior air-ventilation environment for these stainless steel line items, the staff finds the applicant's conclusion that there are no aging effects acceptable. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The inside environment for the

Farley control room ventilation system is similar to the interior air-ventilation environment for the stainless steel ductwork and fittings, FHB post accident filter and fan unit housings, and valve bodies components at VEGP. Therefore, the staff concludes that stainless steel ductwork and fittings, FHB post accident filter and fan unit housings and valve bodies exposed to an interior air-ventilation environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-14, the applicant stated that fiber, foam and ceramic FHB post accident filter and fan unit moisture eliminators exposed to an exterior air-ventilation environment do not exhibit aging effects requiring management. The applicant stated that there has never been any plant-specific aging effect noted for this component. The staff's review of site operating experience did not identify any aging effects for these components at VEGP. On the basis of its review of current industry research and current plant operating experience, the staff concludes that fiber, foam and ceramic FHB post accident filter and fan unit moisture eliminators exposed to an exterior air-ventilation environment at VEGP do not exhibit aging effects requiring management.

In LRA Table 3.3.2-14, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking, for elastomer flexible connectors exposed to an interior air-ventilation environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. On the basis of its review, the staff finds that the aging effect of change in material properties, for which the applicant includes hardening, loss of strength and cracking, for elastomer flexible connectors exposed to an interior air-ventilation environment, will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-14, the applicant proposed to manage the loss of material for carbon steel piping components exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the fuel handling building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-14, the applicant stated that copper alloy piping components exposed to an interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item SP-6 for steam and power conversion systems which applies to copper alloy piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for copper alloy piping, piping components, and piping elements exposed to indoor uncontrolled air which is either the same or a more aggressive environment than the interior air-ventilation environment for this copper alloy line item, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that copper alloy piping components exposed to an interior air-ventilation environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-14, the applicant stated that stainless steel piping components exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior indoor air environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that stainless steel piping components exposed to an interior indoor air environment do not exhibit aging effects requiring management.

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 Ventilation Systems - Diesel Generator Building: Summary of Aging Management Review – LRA Table 3.3.2-15

The staff reviewed LRA Table 3.3.2-15, which summarizes the results of AMR evaluations for the ventilation systems - diesel generator building component groups.

In LRA Table 3.3.2-15, the applicant proposed to manage the loss of material for carbon steel diesel generator building ventilation system damper housings, fan housings, and filter housings, exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff’s evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the diesel generator building ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel diesel generator building ventilation system damper housings, fan housings, and filter housings exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-15, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant’s Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, “Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components”, with exceptions. Suggest we say something specific about how the Piping and Duct Internal Inspection Program relates to and manages elastomer flexible connectors. The staff also verified that like GALL AMP XI.M20, “Open-Cycle Cooling Water System,” the scope of the applicant’s program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant’s letter of March 20, 2008.

The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff’s evaluation described in SER Section 3.0.3.2.13 includes the staff’s basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to elastomeric components in the auxiliary systems. On the basis of its review, the staff finds that the aging effect of change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment will be effectively managed by the Piping and Duct Internal 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).

3.3.2.3.16 Ventilation Systems - Auxiliary Feedwater Pumphouse: Summary of Aging Management Review – LRA Table 3.3.2-16

The staff reviewed LRA Table 3.3.2-16, which summarizes the results of AMR evaluations for the ventilation systems - auxiliary feedwater pumphouse component groups.

In LRA Table 3.3.2-16, the applicant proposed to manage the loss of material for carbon steel damper housings and fan housings exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the auxiliary feedwater pumphouse ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel damper housings and fan housings exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-16, the applicant stated that stainless steel ductwork and fittings exposed to an interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior air-ventilation environment for this stainless steel line item, the staff finds it acceptable that there are no aging effects. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The inside environment for the Farley control room ventilation system is analogous to the interior. Therefore, the staff concludes that stainless steel ductwork and fittings exposed to an interior air-ventilation environment do not exhibit aging effects requiring management.

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 Ventilation Systems - Miscellaneous: Summary of Aging Management Review – LRA Table 3.3.2-17

The staff reviewed LRA Table 3.3.2-17, which summarizes the results of AMR evaluations for the ventilation systems - miscellaneous component groups.

In LRA Table 3.3.2-17, the applicant proposed to manage the loss of material for carbon steel miscellaneous ventilation system damper housings, fan housings, and filter housings, exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the miscellaneous ventilation systems within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the aging management of loss of material for carbon steel exposed to an air/gas environment in a diesel ventilation system by the One-Time Inspection Program has been previously accepted by the staff. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel miscellaneous ventilation system damper housings, fan housings, and filter housings exposed to an interior air-ventilation environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-17, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. On the basis of its review, the staff finds that the aging effect of change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior air-ventilation environment will be effectively managed by the Piping and Duct Internal 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).

3.3.2.3.18 Ventilation Systems - Radwaste Buildings: Summary of Aging Management Review – LRA Table 3.3.2-18

The staff reviewed LRA Table 3.3.2-18, which summarizes the results of AMR evaluations for the ventilation systems - radwaste buildings component groups.

In LRA Table 3.3.2-18, the applicant proposed to manage the loss of material for carbon steel damper housings exposed to an interior air-ventilation environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the radwaste buildings ventilation system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior air-ventilation environment is either not present or is proceeding very slowly. In addition, the staff confirmed that the aging management of loss material for carbon steel exposed to an air/gas environment in a control room ventilation system by the One-Time Inspection Program has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The air/gas environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment for the carbon steel damper housing components at VEGP. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel damper housings exposed to an interior air-ventilation environment will be effectively managed by 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).

3.3.2.3.19 Fire Protection Systems: Summary of Aging Management Review – LRA Table 3.3.2-19

The staff reviewed LRA Table 3.3.2-19, which summarizes the results of AMR evaluations for the fire protection systems component groups.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of preload either for carbon steel closure bolting or stainless steel closure bolting exposed either to an external air (outdoor) environment or an external soil environment using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload for either carbon steel closure bolting or stainless steel closure bolting exposed either to an external air (outdoor) environment or an external soil environment will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material for cast iron fire hydrants exposed to an external environment of outdoor air (wetted) using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material for cast iron fire hydrants exposed to an external environment of outdoor air (wetted) will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-19, the applicant proposed to manage the loss of material for aluminum alloy flame elements and flame arrestor housings exposed to an internal air (outdoor) environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the fire protection system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material for aluminum alloy in an interior outdoor air environment is either not present or is proceeding very slowly.

On the basis of its review, the staff finds that the aging effect of loss of material for flame arrestor elements and flame arrestor housings exposed to an internal air (outdoor) environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.5.2-19, the applicant stated that stainless steel flame arrestor housings exposed to an interior outdoor air environment and stainless steel flame arrestor housings, flow orifice/elements, and valve bodies, exposed to an exterior outdoor air environment do not exhibit aging effects requiring management. The outdoor air environment at VEGP is subject to normal periodic wetting but is not exposed to an aggressive environment from any nearby industrial facilities or to a salt water environment which could have the potential to concentrate contaminates and cause aging effects for stainless steel. In addition, there is no VEGP operating experience which indicates aging effects for stainless steel in the outdoor air environment has occurred. The GALL Report Volume 2 does contain line item AP-18 for auxiliary systems which does not identify any aging effects requiring management for stainless steel component types exposed to air with borated water leakage which is a more aggressive environment than the interior outdoor air environment and exterior outdoor air environment for these AMR items. On the basis of its review of the current plant operating experience and other more aggressive GALL Report environments for stainless steel, the staff concludes that stainless steel flame arrestor housings exposed to an interior outdoor air environment and stainless steel flame arrestor housings, flow orifice/elements, and valve bodies, exposed to an exterior outdoor air environment at VEGP do not exhibit aging effects requiring management.

In LRA Table 3.3.2-19, the applicant stated that copper alloy flow orifice/elements, hose station nozzles, and hose connections, exposed to an external air (indoor) environment do not exhibit any aging effects requiring management. The staff finds this acceptable because the GALL Report does not identify any aging effects requiring management for copper alloy less than 15 percent Zn component types exposed to air with borated water leakage which is a more aggressive environment than the air (exterior) environment in these line items. Therefore, copper alloy in an external air (indoor) environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-19, the applicant proposed to manage cracking of aluminum alloy (>6 percent Mg) piping components exposed to an internal raw water environment using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.6. The Fire Protection Program is an existing program which describes enhancements to perform wall thickness evaluations on water suppression piping systems using non-intrusive volumetric testing or visual inspections to ensure that wall thicknesses are within acceptable limits, as specified by GALL AMP XI.M27. Further, the staff noted that initial wall thickness evaluations will be performed before the end of the current operating term and that subsequent evaluations are performed at plant-specific intervals during the period of extended operation. The plant-specific inspection intervals will be determined based on previous evaluations and site operating experience. On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of aluminum alloy (>6 percent Mg) piping components exposed to an internal raw water environment will be effectively managed by the Fire Protection Program.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material due to selective leaching for gray cast iron piping components exposed to an external air (indoor) environment using the One-Time Inspection Program for Selective Leaching.

The staff's evaluation of the One-Time Inspection Program for Selective Leaching is documented in SER Section 3.0.3.2.12. The One-Time Inspection Program for Selective Leaching description states that the program will be a one-time inspection program to assess selective leaching in susceptible cast iron and copper alloy components. The program includes a one-time examination of a sample population of components most likely to exhibit selective leaching. The new VEGP program is to provide objective evidence that the aging effect is not occurring, or that the aging effect is occurring slowly enough not to affect the SSCs intended function during the period of extended operation, and thus not require additional aging management. The inspections will be performed within a window of ten years immediately preceding the period of extended operation. If degradation due to selective leaching is identified, additional examinations will be performed. This program is a new program consistent with GALL AMP XI.M33, "Selective Leaching of Materials" with an exception that the program may use other detection techniques instead of, or in addition to, visual examination and hardness measurement. For some component locations, visual examination and hardness measurement may not be feasible due to geometry and configuration issues. Other examination methods which are equally effective in detecting and assessing the extent of selective leaching may be used. Examination techniques may include hardness measurement (where feasible based on form and configuration), visual examination, metallurgical evaluation, or other proven techniques determined to be effective in identifying and assessing the extent of selective leaching. If any conditions do not meet the acceptance criteria, the applicant will take appropriate actions to prevent the component from being returned to service until required corrective actions have been completed. On the basis of its review, the staff finds that the aging effect of loss of material due to selective leaching for gray cast iron piping components exposed to an external air (indoor) environment will be effectively managed by the One-Time Inspection Program for Selective Leaching.

In LRA Table 3.3.2-19, the applicant stated that copper alloy piping components, sprinkler heads, spray nozzles and valve bodies exposed to either an internal air (indoor) environment external air (outdoor) environment do not exhibit any aging effects requiring management. The staff finds this acceptable because the GALL Report does not identify any aging effects requiring management for copper alloy less than 15 percent Zn component types exposed to air with borated water leakage which is a more aggressive environment than the air (exterior) environment in these line items. Therefore, copper alloy in either an internal air (indoor) environment or external air (outdoor) environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-19, the applicant stated that stainless steel piping components, silencers, sprinkler heads, and spray nozzles exposed to an external air (outdoor) environment an internal air (indoor) environment do not exhibit any aging effects requiring management. The staff finds this acceptable because stainless steel is highly resistant to corrosion in dry air in the absence of corrosive species, as cited in the Metals Handbook, Volume 3 (p. 65) and Volume 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Therefore, stainless steel in either an external air (outdoor) environment or an internal air (indoor) environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-19, the applicant stated that aluminum valve bodies exposed to an internal dry gas (halon) environment do not exhibit any aging effects requiring management. Aluminum has an excellent resistance to corrosion when exposed to a humid air (outdoor or moist air/gas environment). The aluminum oxide film bonds strongly to its surface and 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 highly effective in protecting the aluminum from corrosion. Therefore, the staff finds that aluminum alloy valves bodies exposed to an internal air/gas (halon) environment exhibit no aging effects, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material due to selective leaching either for gray cast iron piping components and valve bodies or copper alloy (Zn >15 percent) piping components exposed to an internal fuel oil environment using the One-Time Inspection Program for Selective Leaching.

The staff's evaluation of the One-Time Inspection Program for Selective Leaching is documented in SER Section 3.0.3.2.12. The One-Time Inspection Program for Selective Leaching description states that the program will be a one-time inspection program to assess selective leaching in susceptible cast iron and copper alloy components. The program includes a one-time examination of a sample population of components most likely to exhibit selective leaching. The new VEGP program is to provide objective evidence that the aging effect is not occurring, or that the aging effect is occurring slowly enough not to affect the SSCs intended function during the period of extended operation, and thus not require additional aging management. The inspections will be performed within a window of ten years immediately preceding the period of extended operation. If degradation due to selective leaching is identified, additional examinations will be performed. This program is a new program consistent with GALL AMP XI.M33, "Selective Leaching of Materials" with an exception that the program may use other detection techniques instead of, or in addition to, visual examination and hardness measurement. For some component locations, visual examination and hardness measurement may not be feasible due to geometry and configuration issues. Other examination methods which are equally effective in detecting and assessing the extent of selective leaching may be used. Examination techniques may include hardness measurement (where feasible based on form and configuration), visual examination, metallurgical evaluation, or other proven techniques determined to be effective in identifying and assessing the extent of selective leaching. Any conditions which do not meet the acceptance criteria, the applicant will take appropriate actions to prevent the component from being returned to service until required corrective actions have been completed. On the basis of its review, the staff finds that the aging effect of loss of material due to selective leaching either for gray cast iron piping components and valve bodies or copper alloy (Zn >15 percent) piping components exposed to an internal fuel oil environment will be effectively managed by the One-Time Inspection Program for Selective Leaching.

In LRA Table 3.3.2-19, the applicant proposed to manage loss of material due to selective leaching for gray cast iron valve bodies exposed to an external wetted (outdoor) environment using the One-Time Inspection Program for Selective Leaching.

The staff's evaluation of the One-Time Inspection Program for Selective Leaching is documented in SER Section 3.0.3.2.12. The One-Time Inspection Program for Selective

Leaching description states that the program will be a one-time inspection program to assess selective leaching in susceptible cast iron and copper alloy components. The program includes a one-time examination of a sample population of components most likely to exhibit selective leaching. The new VEGP program is to provide objective evidence that the aging effect is not occurring, or that the aging effect is occurring slowly enough not to affect the SSCs intended function during the period of extended operation, and thus not require additional aging management. The inspections will be performed within a window of ten years immediately preceding the period of extended operation. If degradation due to selective leaching is identified, additional examinations will be performed. This program is a new program consistent with GALL AMP XI.M33, “Selective Leaching of Materials” with an exception that the program may use other detection techniques instead of, or in addition to, visual examination and hardness measurement. For some component locations, visual examination and hardness measurement may not be feasible due to geometry and configuration issues. Other examination methods which are equally effective in detecting and assessing the extent of selective leaching may be used. Examination techniques may include hardness measurement (where feasible based on form and configuration), visual examination, metallurgical evaluation, or other proven techniques determined to be effective in identifying and assessing the extent of selective leaching. For any conditions which do not meet the acceptance criteria, the applicant will take appropriate actions to prevent the component from being returned to service until required corrective actions have been completed. On the basis of its review, the staff finds that the aging effect of loss of material due to selective leaching for gray cast iron valve bodies exposed to an external wetted (outdoor) environment will be effectively managed by the One-Time Inspection Program for Selective Leaching.

In LRA Table 3.3.2-19, the applicant stated that copper alloy valve bodies exposed to an internal air (indoor) environment do not exhibit any aging effects requiring management. The staff finds this acceptable because the GALL Report does not identify any aging effects requiring management for copper alloy less than 15 percent Zn component types exposed to air with borated water leakage which is a more aggressive environment than the air (exterior) environment in these line items. Therefore, copper alloy in an internal air (indoor) environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the extended period of operation.

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 Emergency Diesel Generator System: Summary of Aging Management Review – LRA Table 3.3.2-20

The staff reviewed LRA Table 3.3.2-20, which summarizes the results of AMR evaluations for the emergency diesel generator system component groups.

In LRA Table 3.3.2-20, the applicant proposed to manage loss of preload for carbon steel closure bolting exposed to an external environment of outdoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of carbon steel closure bolting exposed to an external environment of outdoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-20, the applicant proposed to manage the loss of material for aluminum alloy flame arrestor elements and flame arrestor housings exposed to an interior outdoor air environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the emergency diesel generator system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material for aluminum alloy in an interior outdoor air environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for aluminum alloy flame arrestor elements and flame arrestor housings exposed to an interior outdoor air environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.5.2-20, the applicant stated that stainless steel flame arrestor elements exposed to an interior outdoor air environment and stainless steel flame arrestor elements, flexible connectors, pipe components and valve bodies exposed to an exterior outdoor air environment do not exhibit aging effects requiring management. The outdoor air environment at VEGP is subject to normal periodic wetting but is not exposed to an aggressive environment from any nearby industrial facilities or to a salt water environment which could have the potential to concentrate contaminates and cause aging effects for stainless steel. In addition, there is no VEGP operating experience which indicates aging effects for stainless steel in the outdoor air environment has occurred. The GALL Report Volume 2 does contain line item AP-18 for auxiliary systems which does not identify any aging effects requiring management for stainless steel component types exposed to air with borated water leakage which is a more aggressive environment than the interior outdoor air environment and exterior outdoor air environment for these AMR items. On the basis of its review of the current plant operating experience and other more aggressive GALL Report environments for stainless steel, the staff concludes that stainless steel flame arrestor elements exposed to an interior outdoor air environment and stainless steel flame arrestor elements, flexible connectors, pipe components and valve bodies exposed to an exterior outdoor air environment at VEGP do not exhibit aging effects requiring management.

In LRA Table 3.3.2-20, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior diesel exhaust environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. On the basis of its review, the staff finds that the aging effect change in material properties, for which the applicant includes hardening, loss of strength and cracking; for elastomer flexible connectors exposed to an interior diesel exhaust environment will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-20, the applicant proposed to manage change in material properties, for which the applicant includes hardening, loss of strength and cracking, for elastomer flexible connectors exposed to an external environment of outdoor air using the "External Surfaces Monitoring Program."

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of change in material properties for elastomer flexible connectors exposed to an external environment of outdoor air will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-20, the applicant proposed to manage cracking for carbon steel flow orifice elements, EDG jacket water heat exchanger shells, EDG lube oil heat exchanger channel heads, piping components, EDG jacket water keep warm pump casings, EDG jacket water chemical addition tanks and valve bodies exposed to an internal environment of closed cycle cooling water from the Auxiliary Component Cooling Water System (ACCW) using the ACCW System Carbon Steel Components Program.

The staff's evaluation of the ACCW System Carbon Steel Components Program is documented in SER Section 3.0.3.3.1. The ACCW System Carbon Steel Components Program description states cracking of carbon steel components exposed to auxiliary component cooling water is managed through a combination of leakage monitoring, routine walkdowns and periodic visual inspections. The program is in response to operating experience related to nitrite induced stress corrosion cracking (SCC) and subsequent component leakage in the VEGP ACCW System components. This program is a plant-specific program. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of cracking for carbon steel flow orifice elements, EDG jacket water heat exchanger shells, EDG lube oil heat exchanger channel heads, piping components, EDG jacket water keep warm pump casings, EDG jacket water chemical addition tanks and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW System will be effectively managed by using the ACCW System Carbon Steel Components Program.

In LRA Table 3.3.2-20, the applicant proposed to manage loss of material due to selective leaching either for copper alloy (Zn >15 percent) EDG lube oil heat exchanger tubesheets or gray cast iron EDG lube oil pump casings exposed to an internal environment of lubricating oil using the One-Time Inspection Program for Selective Leaching.

The staff's evaluation of the One-Time Inspection Program for Selective Leaching is documented in SER Section 3.0.3.2.12. The One-Time Inspection Program for Selective Leaching description states that the program will be a one-time inspection program to assess selective leaching in susceptible cast iron and copper alloy components. The program includes a one-time examination of a sample population of components most likely to exhibit selective leaching. The new VEGP Program is to provide objective evidence that the aging effect is not occurring, or that the aging effect is occurring slowly enough not to affect the SSCs intended function during the period of extended operation, and thus not require additional aging management. The inspections will be performed within a window of ten years immediately preceding the period of extended operation. If degradation due to selective leaching is identified, additional examinations will be performed. This program is a new program consistent with GALL AMP XI.M33, "Selective Leaching of Materials" with an exception that the program may use other detection techniques instead of, or in addition to, visual examination and hardness measurement. For some component locations, visual examination and hardness measurement may not be feasible due to geometry and configuration issues. Other examination methods which are equally effective in detecting and assessing the extent of selective leaching may be used. Examination techniques may include hardness measurement (where feasible based on form and configuration), visual examination, metallurgical evaluation, or other proven techniques determined to be effective in identifying and assessing the extent of selective leaching. Should any conditions be observed which do not meet the acceptance criteria, appropriate actions will be taken to prevent the component from being returned to service until required corrective actions have been completed. On the basis of its review, the staff finds that the aging effect of loss of material due to selective leaching either for copper alloy (Zn >15 percent) EDG lube oil heat exchanger tubesheets or gray cast iron EDG lube oil pump casings exposed to an internal environment of lubricating oil will be effectively managed by the One-Time Inspection Program for Selective Leaching.

In LRA Table 3.3.2-20, the applicant proposed to manage cracking for copper alloy (Zn >15 percent) EDG lube oil heat exchanger tubesheets exposed to an external closed cycle cooling water environment using the Closed Cooling Water Program.

The staff's evaluation of the Closed Cooling Water Program is documented in SER Section 3.0.3.2.4. The Closed Cooling Water Program description states that the program manages loss of material, cracking, and reduction in heat transfer in closed-cycle cooling water systems and the components cooled by these systems. The program includes maintenance of corrosion inhibitor, pH buffering agent, and biocide concentrations. Concentrations of detrimental ionic species are monitored and reduced if necessary. Important diagnostic parameters are monitored and evaluated for significant trends. The program also uses corrosion-monitoring activities including trending of iron and copper concentrations and component inspections. Corrosion rate monitoring methods may also be used. The program will indicate the components in each system that is most susceptible to various corrosion mechanisms and to ensure that corrosion monitoring is appropriately implemented. On the basis of its review, the staff finds that the aging effect cracking for copper alloy (Zn >15 percent) EDG lube oil heat exchanger tubesheets exposed to an external closed cycle cooling water environment will be effectively managed by the Closed Cooling Water Program.

In LRA Table 3.3.2-20, the applicant proposed to manage loss of material for carbon steel piping components and valve bodies exposed to an interior dirty drainage environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff's evaluation described in SER Section 3.0.3.2.13 includes that staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to steel components in the auxiliary systems. 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.
On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components and valve bodies exposed to an interior dirty drainage environment will be effectively managed by the Piping and Duct Internal Inspection Program.

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 Demineralized Water System: Summary of Aging Management Review – LRA Table 3.3.2-21

The staff reviewed LRA Table 3.3.2-21, which summarizes the results of AMR evaluations for the demineralized water system component groups.

In LRA Table 3.3.2-21, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity 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).

3.3.2.3.22 Hydrogen Recombiner and Monitoring System: Summary of Aging Management Review – LRA Table 3.3.2-22

The staff reviewed LRA Table 3.3.2-22, which summarizes the results of AMR evaluations for the hydrogen recombiner and monitoring system component groups.

In LRA Table 3.3.2-22, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section

A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-22, the applicant stated that stainless steel hydrogen recombiner containment housings, piping components and valve bodies exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior indoor air environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that stainless steel hydrogen recombiner containment housings, piping components and valve bodies exposed to an interior indoor air environment do not exhibit aging effects requiring management.

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 Drain Systems: Summary of Aging Management Review – LRA Table 3.3.2-23

The staff reviewed LRA Table 3.3.2-23, which summarizes the results of AMR evaluations for the drain systems component groups.

In LRA Table 3.3.2-23, the applicant proposed to manage loss of preload either for carbon steel, copper alloy or stainless steel closure bolting exposed to an external environment of outdoor or indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload either for carbon steel carbon steel, copper alloy or stainless steel closure bolting exposed to an external environment of outdoor or indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-23, the applicant proposed to manage the loss of material for cast iron drain bodies exposed to an interior indoor air environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the drain system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior indoor air environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for cast iron drain bodies exposed to an interior indoor air environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-23, the applicant stated that lead alloy floor drain plugs exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. The staff finds this acceptable because there is no indication in the industry that lead alloys exposed to an interior air indoor environment have any aging effects requiring management. The lack of historic negative operating experience indicates that lead alloy is not likely to experience any degradation from indoor air. Therefore, based on industry experience and the assumption of proper design and application of the material, the staff finds that lead alloy floor drain plugs exposed to an interior indoor air environment exhibit no aging effects requiring management for the period of extended operation.

In LRA Table 3.3.2-23, the applicant proposed to verify the material and that no significant aging has occurred for lead alloy floor drain plugs exposed to an exterior indoor air environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the drain system within the scope of the One-Time Inspection Program. The program will confirm the lead alloy material and that aging of lead alloy floor drain plugs in an exterior indoor air environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the verification of the material and that no significant aging has occurred for lead alloy floor drain plugs exposed to an exterior indoor air environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-23, the applicant proposed to manage loss of material either for carbon steel piping components and valve bodies or copper alloy piping components exposed to an interior dirty drainage environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff's evaluation in SER Section 3.0.3.2.13 includes that staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to carbon steel or stainless steel piping components and valve bodies or copper alloy piping components in the auxiliary systems. On the basis of its review, the staff finds that the aging effect of loss of material either for carbon steel or stainless steel piping components and valve bodies or copper alloy piping components exposed to either an interior or exterior dirty drainage environment will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-23, the applicant proposed to manage loss of material for carbon steel piping components exposed to an external environment of outdoor air (wetted) using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of loss of material for carbon steel piping components exposed to an external environment of outdoor air (wetted) will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-23, the applicant stated that copper alloy piping components exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item SP-6 for steam and power conversion systems which applies to copper alloy piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for copper alloy piping, piping components, and piping elements exposed to indoor uncontrolled air which is either the same or a more aggressive environment than the interior indoor air environment for this copper alloy line item, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that copper alloy piping components exposed to an interior indoor air environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-23, the applicant stated that PVC piping components exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. The staff finds this acceptable because there is no indication in the industry that PVC or thermoplastics exposed to an internal indoor air environment have any aging effects requiring management. The generally low operating temperatures and historical good chemical resistance data for PVC components, combined with a lack of historic negative operating experience, indicate that PVC is not likely to experience any degradation from the non-aggressive indoor air. PVC materials do not display corrosion rates as metals do, but rather rely on chemical resistance to the environments to which they are exposed. Therefore, based on industry experience and the assumption of proper design and application of the material, the staff finds that PVC piping components exposed to an interior indoor air environment exhibit no aging effects requiring management for the period of extended operation.

In LRA Table 3.3.2-23, the applicant proposed to manage change in material properties, for which the applicant includes cracking, for PVC piping components exposed to an external environment of indoor air using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of change in material properties for PVC piping components exposed to an external environment of indoor air will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-23, the applicant stated that stainless steel piping components and valve bodies exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior indoor air environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that stainless steel piping components and valve bodies exposed to an interior indoor air environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-23, the applicant proposed to manage the loss of material for stainless steel piping components and valve bodies exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the waste management system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for stainless steel piping components and valve bodies exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-23, the applicant stated that polypropylene acid neutralizing sump tanks exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. The staff finds this acceptable because there is no indication in the industry that thermoplastics exposed to an internal indoor air environment have any aging effects requiring management. The generally low operating temperatures and historical good chemical resistance data for thermoplastic components, combined with a lack of historic negative operating experience, indicate that polypropylene is not likely to experience any degradation from the non-aggressive indoor air. Thermoplastic materials do not display corrosion rates as metals do, but rather rely on chemical resistance to the environments to which they are exposed. Therefore, based on industry experience and the assumption of proper design and application of the material, the staff finds that the polypropylene acid neutralizing sump tanks exposed to an interior indoor air environment exhibit no aging effects requiring management for the period of extended operation.

In LRA Table 3.3.2-23, the applicant proposed to manage change in material properties, for which the applicant includes cracking, for polypropylene acid neutralizing sump tanks exposed to an external environment of indoor air using the External Surfaces Monitoring Program.

The staff verified that the VEGP External Surfaces Monitoring Program is a new program that inspects external surfaces of mechanical system components requiring aging management for license renewal in external air environments. Surfaces constructed from materials susceptible to aging in these environments are inspected at frequencies that assure the effects of aging are managed such that system components will perform their intended function during the period of extended operation. The program will be a monitoring program, which manages aging effects through periodic visual inspections of external surfaces of components such as piping, piping components, ducting, and other components for evidence of material loss. The staff's evaluation of the External Surfaces Monitoring Program is documented in SER Section 3.0.3.3.5. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of change in material properties for polypropylene acid neutralizing sump tanks exposed to an external environment of indoor air will be effectively managed by the External Surfaces Monitoring Program.

In LRA Table 3.3.2-23, the applicant proposed to manage the loss of material for carbon steel valve bodies exposed to an interior indoor air environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the drain system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior indoor air environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel valve bodies exposed to an interior indoor air environment will be effectively managed by 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).

3.3.2.3.24 Potable and Utility Water Systems: Summary of Aging Management Review – LRA Table 3.3.2-24

The staff reviewed LRA Table 3.3.2-24, which summarizes the results of AMR evaluations for the potable and utility water systems component groups.

In LRA Table 3.3.2-24, the applicant proposed to manage the loss of material for copper alloy water hammer arrestors, piping components, hot water recirculation pump casings, strainer housings, and valve bodies exposed to an interior domestic water environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the potable and utility water system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior domestic water environment is either not present or is proceeding very slowly.

On the basis of its review, the staff finds that the aging effect of loss of material for copper alloy water hammer arrestors, piping components, hot water recirculation pump casings, strainer housings, and valve bodies exposed to an interior domestic water environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-24, the applicant proposed to manage loss of preload for copper alloy closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of copper alloy closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-24, the applicant proposed to manage loss of material for carbon steel water heater housings and jackets exposed to an internal environment of domestic water using the Periodic Surveillance and Preventive Maintenance Activities Program.

The staff's evaluation of the Periodic Surveillance and Preventive Maintenance Activities Program is documented in SER Section 3.0.3.3.6. The Periodic Surveillance and Preventive Maintenance Activities Program description states that the program provides for periodic component inspections and testing to detect aging effects. The extent and schedule of inspections and testing assure detection of component degradation prior to loss of intended functions. Inspection and testing intervals are established to provide timely detection of degradation and are dependent on the component, material, and environment, and take into consideration industry and plant-specific operating experience and manufacturer's recommendations. Inspection and testing activities monitor various parameters such as surface condition, loss of material, presence of corrosion products or fluid leakage, signs of cracking, or reduction of wall thickness. Inspection techniques such as visual are used. The staff verified that visual inspection of the within scope potable water system water heater housings has been added to this program as a preventive maintenance task that will manage loss of material by inspecting for evidence of leakage and loss of material on the housing. This program is a plant-specific program. On the basis of its review, the staff finds that because this component will be inspected periodically, the aging effect of loss of material for carbon steel water heater housings and jackets exposed to an internal environment of domestic water will be effectively managed by the Periodic Surveillance and Preventive Maintenance Activities 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).

3.3.2.3.25 Radiation Monitoring System: Summary of Aging Management Review – LRA Table 3.3.2-25

The staff reviewed LRA Table 3.3.2-25, which summarizes the results of AMR evaluations for the radiation monitoring system component groups.

In LRA Table 3.3.2-25, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-25, the applicant proposed to manage cracking for carbon steel piping components and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW using the ACCW System Carbon Steel Components Program.

The staff's evaluation of the ACCW System Carbon Steel Components Program is documented in SER Section 3.0.3.3.1. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of cracking for carbon steel piping components and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW system will be effectively managed by the ACCW System Carbon Steel Components Program.

In LRA Table 3.3.2-25, the applicant proposed to manage loss of material for carbon steel piping components exposed to an interior dirty drainage environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components", with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and

Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff's evaluation described in SER Section 3.0.3.2.13 includes that staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to carbon steel piping components in the auxiliary systems. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior dirty drainage environment will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-25, the applicant proposed to manage loss of material for carbon steel piping components exposed to an interior treated water (aggressive chemistry) environment using the Flow-Accelerated Corrosion Program.

The staff's evaluation of the Flow-Accelerated Corrosion Program is documented in SER Section 3.0.3.2.7. The Flow-Accelerated Corrosion Program description states that the program manages loss of material (wall thinning) due to FAC in susceptible plant piping and other components. The program includes analysis to determine susceptible locations, predictive modeling techniques, baseline inspections of wall thickness, follow-up inspections, and repair or replacement of degraded components as necessary. This program is consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion Program," with exceptions. One exception is that the VEGP Flow-Accelerated Corrosion Program will encompass wall thinning resulting from FAC and will also be used to manage similar phenomena such as cavitation, impingement, and erosion, for piping or components whose failure could result in personnel injuries or detrimental operation effects in systems determined to be susceptible to FAC. Due to this exception, VEGP also uses the Flow-Accelerated Corrosion Program and its inspection techniques to manage wall thinning that is occurring in piping components downstream of the steam generator blowdown demineralizers that is not attributed to FAC. The wall thinning has been attributed to the acidic conditions of the demineralizer effluent. The environment is low temperature and low pressure, so FAC has been eliminated as a cause for this thinning. Ultrasonic testing (UT) is the primary technique used for FAC inspections. Radiographic testing (RT) is also permissible where practical. In addition to UT and RT the VEGP Flow-Accelerated Corrosion Program permits the use of other industry-accepted inspection techniques when practical. Visual inspection (VT) from inside the piping may be performed in certain large-bore systems. On the basis that the VEGP Flow-Accelerated Corrosion Program includes inspections for loss of material in piping components not susceptible to FAC by the same FAC inspection techniques, the staff finds that the aging effect of loss of material for carbon steel piping components exposed to an interior treated water (aggressive chemistry) environment will be effectively managed by the Flow-Accelerated Corrosion Program.

In LRA Table 3.3.2-25, the applicant stated that stainless steel piping components and valve bodies exposed to either an interior indoor air environment or interior air-ventilation environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior indoor air environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. In addition, the staff confirmed that the declaration that stainless steel components exposed to an inside environment in a control room ventilation system experience no aging effects has been previously accepted by the staff in the Farley Nuclear Plant license renewal application SER (NUREG-1825). The inside environment for the Farley control room ventilation system is analogous to the interior air-ventilation environment for the stainless steel piping components and valve bodies at VEGP. Therefore, the staff concludes that stainless steel piping components and valve bodies exposed either to an interior indoor air environment or interior air-ventilation environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-25, the applicant stated that stainless steel pipe components exposed to an exterior outdoor air environment do not exhibit aging effects requiring management. The outdoor air environment at VEGP is subject to normal periodic wetting but is not exposed to an aggressive environment from any nearby industrial facilities or to a salt water environment which could have the potential to concentrate contaminates and cause aging effects for stainless steel. In addition, there is no VEGP operating experience which indicates aging effects for stainless steel in the outdoor air environment has occurred. The GALL Report Volume 2 does contain line item AP-18 for auxiliary systems which does not identify any aging effects requiring management for stainless steel component types exposed to air with borated water leakage which is a more aggressive environment than the exterior outdoor air environment for this line item. On the basis of its review of the current plant operating experience and other more aggressive GALL environments for stainless steel, the staff concludes that stainless steel pipe components exposed to an exterior outdoor air environment at VEGP do not exhibit aging effects requiring management.

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 Reactor Makeup Water Storage Tank and Degasifier System: Summary of Aging Management Review – LRA Table 3.3.2-26

The staff reviewed LRA Table 3.3.2-26, which summarizes the results of AMR evaluations for the reactor makeup water storage tank and degasifier system component groups.

In LRA Table 3.3.2-26, the applicant proposed to manage loss of preload either for carbon steel or stainless steel closure bolting exposed to an external environment of outdoor or indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity

Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload either for carbon steel or stainless steel closure bolting exposed to an external environment of outdoor or indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.5.2-26, the applicant stated that stainless steel pipe components and valve bodies exposed to an exterior outdoor air environment and stainless steel tank liners (and internals) for reactor makeup water storage tanks exposed to an interior outdoor air environment do not exhibit aging effects requiring management. The outdoor air environment at VEGP is subject to normal periodic wetting but is not exposed to an aggressive environment from any nearby industrial facilities or to a salt water environment which could have the potential to concentrate contaminates and cause aging effects for stainless steel. In addition, there is no VEGP operating experience which indicates aging effects for stainless steel in the outdoor air environment has occurred. The GALL Report Volume 2 does contain line item AP-18 for auxiliary systems which does not identify any aging effects requiring management for stainless steel component types exposed to air with borated water leakage which is a more aggressive environment than the exterior outdoor air environment and interior outdoor air environment for these AMR items. On the basis of its review of the current plant operating experience and other more aggressive GALL Report environments for stainless steel, the staff concludes that stainless steel pipe components and valve bodies exposed to an exterior outdoor air environment and stainless steel tank liners (and internals) for reactor makeup water storage tanks exposed to an interior outdoor air environment at VEGP do not exhibit aging effects requiring management.

In LRA Table 3.3.2-26, the applicant proposed to manage change in material properties, for which the applicant includes cracking, for elastomer tank diaphragms of reactor makeup water storage tanks exposed either to an internal environment of treated water or external environment of outdoor air using the Periodic Surveillance and Preventive Maintenance Activities Program.

The staff's evaluation of the Periodic Surveillance and Preventive Maintenance Activities Program is documented in SER Section 3.0.3.3.6. The Periodic Surveillance and Preventive Maintenance Activities Program description states that the program provides for periodic component inspections and testing to detect aging effects. The extent and schedule of inspections and testing assure detection of component degradation prior to loss of intended functions. Inspection and testing intervals are established to provide timely detection of degradation and are dependent on the component, material, and environment, and take into consideration industry and plant-specific operating experience and manufacturer's recommendations. Inspection and testing activities monitor various parameters such as surface condition, loss of material, presence of corrosion products or fluid leakage, signs of cracking, or reduction of wall thickness. Inspection techniques such as visual are used. The staff verified that visual inspections of the Boric Acid Storage Tank (BAST), Condensate Storage Tank (CST), and Reactor Make-up Water Storage Tank (RMWST) diaphragms are existing preventive maintenance tasks that manage change in material properties (including cracking) and loss of material on the internal elastomer diaphragms in these tanks. This program is a plant-specific program. On the basis of its review, the staff finds that because this component will be inspected periodically, the aging effect of change in material properties, for which the applicant includes cracking, for elastomer tank diaphragms of reactor makeup water storage tanks exposed either to an internal environment of treated water or external environment of outdoor air will be effectively managed by the Periodic Surveillance and Preventive Maintenance Activities 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).

3.3.2.3.27 Sampling Systems: Summary of Aging Management Review – LRA Table 3.3.2-27

The staff reviewed LRA Table 3.3.2-27, which summarizes the results of AMR evaluations for the sampling systems component groups.

In LRA Table 3.3.2-27, the applicant proposed to manage loss of preload either for aluminum alloy or stainless closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload either for aluminum alloy or stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-27, the applicant proposed to manage cracking for carbon steel piping components, shells and end plates of the primary and secondary side of sample coolers, and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW using the ACCW System Carbon Steel Components Program.

The staff's evaluation of the ACCW System Carbon Steel Components Program is documented in SER Section 3.0.3.3.1. The ACCW System Carbon Steel Components Program description states cracking of carbon steel components exposed to auxiliary component cooling water is managed through a combination of leakage monitoring, routine walkdowns and periodic visual inspections. The program is in response to operating experience related to nitrite induced SCC and subsequent component leakage in the VEGP

ACCW system components. This program is a plant-specific program. On the basis of its review, the staff finds that because these components will be inspected periodically, the aging effect of cracking for carbon steel piping components, shells and end plates of the primary and secondary side of sample coolers, and valve bodies exposed to an internal environment of closed cycle cooling water from the ACCW system will be effectively managed by the ACCW System Carbon Steel Components Program.

In LRA Table 3.3.2-27, the applicant proposed to manage the loss of material for carbon steel piping components and valve bodies exposed to an interior miscellaneous gas environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the sampling system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior miscellaneous gas environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel piping components and valve bodies exposed to an interior miscellaneous gas environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-27, the applicant proposed to manage the loss of material for galvanized steel piping components exposed to an interior treated water environment using the Water Chemistry Control and the One-Time Inspection Programs.

The staff evaluations of the Water Chemistry Control and One-Time Inspection Programs are documented in SER Sections 3.0.3.1.4 and 3.0.3.1.2, respectively. The Water Chemistry Control description states that the program mitigates loss of material, cracking, and reduction in heat transfer in system components and structures through the control of water chemistry. The program includes control of detrimental chemical species and the addition of chemical agents. The Water Chemistry Control Program is consistent with GALL AMP XI.M2, "Water Chemistry." The staff verified that the scope of secondary water chemistry control includes sampling of condensate, feedwater, blowdown, the steam generators, and the condensate storage tanks. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the sampling system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material for galvanized steel in an interior treated water environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for galvanized steel piping components exposed to an interior treated water environment will be effectively managed by the Water Chemistry Control and One-Time Inspection Programs.

In LRA Table 3.3.2-27, the applicant proposed to manage cracking for nickel alloy piping components exposed to an interior steam environment using the Water Chemistry Control Program.

The staff evaluation of the Water Chemistry Control Program is documented in SER Section 3.0.3.1.4. The Water Chemistry Control Program description states that the program mitigates loss of material, cracking, and reduction in heat transfer in system components and structures through the control of water chemistry. The program includes control of detrimental chemical species and the addition of chemical agents. The Water Chemistry Control Program is consistent with GALL AMP XI.M2, “Water Chemistry.” The staff verified that the scope of secondary water chemistry control includes sampling of condensate, feedwater, blowdown, the steam generators, and the condensate storage tanks. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item R-36 under reactor vessel, internals, and reactor coolant systems for once through steam generators which applies to nickel alloy steam generator components (such as secondary side nozzles for vents, drains, and instrumentation) in a secondary feedwater/steam environment. This GALL Report Volume 2 line item documents that for this material/environment combination there is the aging effect cracking for which the GALL Report recommends GALL AMP XI.M2, “Water Chemistry” to manage. Because the GALL Report identifies cracking as an aging effect requiring management for nickel alloy steam generator components such as secondary side vent, drain, and instrumentation nozzles exposed to secondary feedwater/steam using the Water Chemistry Program, the staff finds it acceptable to manage cracking for nickel alloy piping components exposed to an interior steam environment using the Water Chemistry Control Program.

In LRA Table 3.3.2-27, the applicant stated that stainless steel piping components and valve bodies exposed to an interior miscellaneous gas environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-22 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in a gas (internal gas environments from dry air, inert or nonreactive gases). This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed to gas which is either the same or very similar to the interior miscellaneous gas environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that stainless steel piping components and valve bodies exposed to an interior miscellaneous gas environment do not exhibit aging effects requiring management.

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 Auxiliary Gas Systems: Summary of Aging Management Review – LRA Table 3.3.2-28

The staff reviewed LRA Table 3.3.2-28, which summarizes the results of AMR evaluations for the auxiliary gas systems component groups.

In LRA Table 3.3.2-28, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant's Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity 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).

3.3.2.3.29 Chilled Water Systems: Summary of Aging Management Review – LRA Table 3.3.2-29

The staff reviewed LRA Table 3.3.2-29, which summarizes the results of AMR evaluations for the chilled water systems component groups.

In LRA Table 3.3.2-29, the applicant stated that carbon steel condenser shells for essential chillers, evaporator shells for essential chillers, and chiller economizer tanks exposed to an interior freon environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-6 for auxiliary systems which applies to steel piping, piping components, and piping elements in a gas environment (defined in the GALL Report as internal gas environments from dry air, inert or nonreactive gases). This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for steel piping, piping components, and piping elements exposed to gas which is either the same or very similar to the interior Freon environment for these carbon steel line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that carbon steel condenser shells for essential chillers, evaporator shells for essential chillers, and chiller economizer tanks exposed to an interior Freon environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-29, the applicant stated that copper alloy condenser tubes for essential chillers and evaporator tubes for essential chillers and copper alloy condenser tubesheets for essential chillers and evaporator tubesheets for essential chillers exposed to an exterior Freon environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-9 for auxiliary systems which applies to copper alloy piping, piping components, and piping elements in a gas environment (defined in the GALL Report as internal gas environments from dry air, inert or nonreactive gases). This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for copper alloy piping, piping components, and piping elements exposed to gas which is either the same or very similar to the exterior Freon environment for these copper alloy line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that copper alloy condenser tubes for essential chillers and evaporator tubes for essential chillers and copper alloy condenser tubesheets for essential chillers and evaporator tubesheets for essential chillers exposed to an exterior Freon environment do not exhibit aging effects requiring management.

In LRA Table 3.3.2-29, the applicant stated that glass sight glasses exposed to an interior closed-cycle cooling water environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-51 for auxiliary systems which applies to glass piping elements in a treated water environment (defined in the GALL Report as demineralized water, which is the base water for all clean systems. Depending on the system, this demineralized water may require additional processing. Treated water could be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments). This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for glass piping elements exposed to treated water which is either the same or very similar to the closed-cycle cooling water environment for this glass line item, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that glass sight glasses exposed to an interior closed-cycle cooling water environment do not exhibit aging effects requiring management.

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 Waste Management Systems: Summary of Aging Management Review – LRA Table 3.3.2-30

The staff reviewed LRA Table 3.3.2-30, which summarizes the results of AMR evaluations for the waste management systems component groups.

In LRA Table 3.3.2-30, the applicant proposed to manage loss of preload for stainless steel closure bolting exposed to an external environment of indoor air using the Bolting Integrity Program.

The staff verified that the applicant’s Bolting Integrity Program is a new plant-specific program and that the scope of the program is credited to manage cracking, loss of material, and loss of preload both safety-related and nonsafety-related closure bolting for pressure-retaining components within the scope of license renewal, with the exception of the reactor vessel head studs which are managed in accordance with the applicant's Reactor Vessel Head Closure Stud Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Bolting Integrity includes an assessment of ability of the program elements to manage aging consistent with the staff's recommended criteria for AMP program elements in Section A.2.1.3 of NRC Branch Position No. RLSB-1 (i.e., in Appendix A of the SRP-LR [NUREG-1800, Revision 1]). On the basis of its review, the staff finds that, because these components will be inspected periodically, the aging effect of loss of preload of stainless steel closure bolting exposed to an external environment of indoor air will be effectively managed by the Bolting Integrity Program.

In LRA Table 3.3.2-30, the applicant proposed to manage the loss of material for stainless steel filter housings, flow orifice elements, piping components, pipe spools for startup strainers, gas decay drain pump casings, backflushable filter crud tanks, and valve bodies exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The staff confirmed that the applicant has included the waste management system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for stainless steel filter housings, flow orifice elements, piping components, pipe spools for startup strainers, gas decay drain pump casings, backflushable filter crud tanks, and valve bodies exposed to an interior clean drainage environment will be effectively managed by the One-Time Inspection Program.

In LRA Table 3.3.2-30, the applicant proposed to manage loss of material either for stainless steel filter housings, piping components, and valve bodies or carbon steel gas traps exposed either to an interior dirty drainage environment or interior indoor air (wetted) environment using the Piping and Duct Internal Inspection Program.

The staff verified that the applicant's Piping and Duct Internal Inspection Program is a new program and has been identified as an AMP that is consistent with program elements in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," with exceptions. The staff also verified that like GALL AMP XI.M20, "Open-Cycle Cooling Water System," the scope of the applicant's program, in part, credits visual examinations to manage corrosion in the internal surfaces of stainless steel piping components that are exposed internally to raw water. The staff also verified that the applicant has addressed the need to implement this AMP in accordance with LRA Commitment No. 19, which was placed on UFSAR Supplement Section A.2.22 and provided in the applicant's letter of March 20, 2008. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff's evaluation of the Piping and Duct Internal Inspection Program is documented in SER Section 3.0.3.2.13. The staff's evaluation described in SER Section 3.0.3.2.13 includes that staff's basis why the Piping and Duct Internal Inspection Program may be used to manage the aging effects that are applicable to stainless steel and carbon steel components in the auxiliary systems. On the basis of its review, the staff finds that the aging effect of loss of material either for stainless steel filter housings, piping components, and valve bodies or carbon steel gas traps exposed either to an interior dirty drainage environment or interior indoor air (wetted) environment will be effectively managed by the Piping and Duct Internal Inspection Program.

In LRA Table 3.3.2-30, the applicant proposed to manage the loss of material for carbon steel gas traps, piping components, and valve bodies exposed to an interior clean drainage environment using the One-Time Inspection Program.

The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.2. The One-Time Inspection Program description states that one-time inspections are to be used to confirm the slow progression or the absence of an aging effect. The staff confirmed that the applicant has included the waste management system within the scope of the One-Time Inspection Program to confirm that the aging effect of loss of material in an interior clean drainage environment is either not present or is proceeding very slowly. On the basis of its review, the staff finds that the aging effect of loss of material for carbon steel gas traps, piping components, and valve bodies exposed to an interior clean drainage environment will be effectively managed by 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).

3.3.2.3.31 Thermal Insulation: Summary of Aging Management Review – LRA Table 3.3.2-31

The staff reviewed LRA Table 3.3.2-31, which summarizes the results of AMR evaluations for the thermal insulation component groups.

In LRA Table 3.3.2-31, the applicant stated that stainless steel jacketing and supports for insulation exposed to an exterior exposed to weather environment do not exhibit aging effects requiring management. The exposed to weather environment at VEGP is subject to normal periodic wetting but is not exposed to an aggressive environment from any nearby industrial facilities or to a salt water environment which could have the potential to concentrate contaminates and cause aging effects for stainless steel. In addition, there is no VEGP operating experience which indicates aging effects for stainless steel in the exposed to weather environment has occurred. The GALL Report Volume 2 does contain line item AP-18 for auxiliary systems which does not identify any aging effects requiring management for stainless steel component types exposed to air with borated water leakage which is a more aggressive environment than the exterior exposed to weather environment for this line item. On the basis of its review of the current plant operating experience and other more aggressive GALL Report environments for stainless steel, the staff concludes that stainless steel jacketing and supports for insulation exposed to an exterior exposed to weather environment at VEGP do not exhibit aging effects requiring management.

In LRA Table 3.3.2-31, the applicant stated that fiber, foam and ceramic thermal insulation exposed to a protected from weather environment do not exhibit aging effects requiring management. The applicant stated that there has never been any plant-specific aging effect noted for these components. The staff's review of site operating experience did not identify any aging effects for these components at VEGP. On the basis of its review of current industry research and current plant operating experience, the staff concludes that fiber, foam and ceramic thermal insulation exposed to a protected from weather environment at VEGP do not exhibit aging effects requiring management.

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 Miscellaneous Leak Detection System: Summary of Aging Management Review – LRA Table 3.3.2-32

The staff reviewed LRA Table 3.3.2-32, which summarizes the results of AMR evaluations for the miscellaneous leak detection system component groups.

In LRA Table 3.3.2-32, the applicant stated that stainless steel piping components exposed to an interior indoor air environment do not exhibit any aging effects requiring management. There is no corresponding GALL Report Table 1 line item or GALL Report Volume 2 Chapter VII line item for this material/environment combination. However, GALL Report Volume 2 does contain line item AP-17 for auxiliary systems which applies to stainless steel piping, piping components, and piping elements in an external indoor uncontrolled air environment. This GALL Report Volume 2 line item documents that there are no aging effects for this material/environment combination. Because the GALL Report does not identify any aging effects requiring management for stainless steel piping, piping components, and piping elements exposed externally to indoor uncontrolled air which is either the same or a more aggressive environment than the interior indoor air environment for these stainless steel line items, the staff finds it acceptable that there are no aging effects. Therefore, the staff concludes that stainless steel piping components exposed to an interior indoor air environment do not exhibit aging effects requiring management.

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).

3.3.3 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:

- main steam system
- feedwater system
- SG blowdown processing system
- auxiliary feedwater system
- auxiliary steam system

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 Reviews for Steam and Power Conversion Systems in Chapter VIII of NUREG-1801," 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 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 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 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.

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 or 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	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.4.2.2.1)
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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2(1))
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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2(1))
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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2(1))
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	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.4.2.2.2(2))

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Sections 3.4.2.2.2(1))and 3.4.2.2.7(1))
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	Yes	Oil Analysis Program (B.3.16) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2(2))
Steel piping, piping components, and piping elements exposed to raw water (3.4.1-8)	Loss of material due to general, pitting, crevice, and microbiologically -influenced corrosion, and fouling	Plant specific	Yes	Not applicable	Not applicable to VEGP (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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.4(1))
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	Yes	Oil Analysis Program (B.3.16) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.4(2))
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 microbiologically -influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.4.2.2.5(1))

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.4.2.2.5(2))
Stainless steel piping, piping components, piping elements exposed to steam (3.4.1-13)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (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 stress corrosion cracking	Water Chemistry and One-Time Inspection	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7(1))
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	Yes	Water Chemistry Control Program (B.3.28) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7(1))
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	Yes	Buried Piping and Tanks Inspection Program (B.3.4)	Consistent with the GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7(2))

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.4.2.2.7(3))
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 microbiologically -influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Oil Analysis Program (B.3.16) and One-Time Inspection Program (B.3.17)	Consistent with the GALL Report, which recommends further evaluation (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	No	External Surfaces Monitoring Program (B.3.8)	Consistent with the GALL Report (See SER Section 3.4.2.1.6)
High-strength steel closure bolting exposed to air with steam or water leakage (3.4.1-21)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	No	Not applicable	Not applicable to VEGP
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	No	Bolting Integrity Program (B.3.2)	Consistent with the GALL Report (See SER Sections 3.4.2.1.1 and 3.4.2.1.2)
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 stress corrosion cracking	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to VEGP
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	No	Not applicable	Not applicable to VEGP

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Not applicable	Not applicable to VEGP
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	No	Not applicable	Not applicable to VEGP
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	No	Not applicable	Not applicable to VEGP
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	No	External Surfaces Monitoring Program (B.3.8)	Consistent with the GALL Report
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	No	Flow Accelerated Corrosion Program (B.3.10)	Consistent with the GALL Report
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	No	Piping and Duct Internal Inspection Program (B.3.22)	Consistent with the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel heat exchanger components exposed to raw water (3.4.1-31)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Periodic Surveillance and Preventive Maintenance Activities (B.3.21)	Consistent with the GALL Report (See SER Section 3.4.2.1.5)
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 microbiologically -influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to VEGP
Stainless steel heat exchanger components exposed to raw water (3.4.1-33)	Loss of material due to pitting, crevice, and microbiologically -influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to VEGP
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	No	Not applicable	Not applicable to VEGP
Copper alloy > 15% 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	No	Not applicable	Not applicable to VEGP
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	No	Not applicable	Not applicable to VEGP
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	No	Water Chemistry Control Program (B.3.28)	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Boric Acid Corrosion Control Program (B.3.3)	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	No	Water Chemistry Control Program (B.3.28)	Consistent with GALL Report
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	No	Not applicable	Not applicable to VEGP
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	No	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.4.1-42)	None	None	No	Not applicable	Not applicable to VEGP
Steel and stainless steel piping, piping components, and piping elements in concrete (3.4.1-43)	None	None	No	None	Consistent with GALL Report
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.4.1-44)	None	None	No	None	Consistent with GALL Report

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

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:

- Bolting Integrity Program
- Boric Acid Corrosion Control Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Activities
- Piping and Duct Internal Inspection Program
- Water Chemistry Control Program

LRA Tables 3.4.2-1 through 3.4.2-5 summarize AMRs for the steam and power conversion 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 Report 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 Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted.

The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 Report 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 determined 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 Report 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 Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 or NUREG-1801 identifies a plant specific aging management program. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report 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 (Item1)

During the audit and review, the staff noted that for VEGP AMR items 1a and 1d of LRA Table 3.4.2-1; 1a and 1c of LRA Table 3.4.2-2; 1a of LRA Table 3.4.2-3; 1a and 1d of LRA Table 3.4.2-4; and 1a and 1d of LRA Table 3.4.2-5, the applicant provides its AMRs on loss of material due to general, pitting and crevice corrosion in carbon S&PC bolting under exposure to either an air indoor (exterior) environment or an air outdoor (exterior) environment. The applicant uses a standard Note E for these AMR line items that roll up to the LRA Table 3.4.1, Item 22. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program. The applicant has credited its Bolting Integrity Program to manage loss of material in surfaces of these bolting components that are exposed to either the air indoor (exterior) environment or the air outdoor (exterior) environment.

The GALL AMR items (VIII.H-1 and VIII.H-4) that pertain to these VEGP AMR items that roll up to the LRA Table 3.4.1, Item 22, recommend GALL AMP XI.M18, “Bolting Integrity” for managing these aging effects while the LRA uses the Bolting Integrity Program, which is a plant specific program. The staff reviewed the applicant’s Bolting Integrity Program, and the staff’s evaluation is documented in SER Section 3.0.3.3.2. During the audit and review, the staff agreed with the applicant’s determination that these LRA line items are consistent with the GALL Report, except using a plant specific AMP. On the basis of the staff’s evaluation of the AMP and the staff’s determination that the applicant’s AMR results are consistent with the GALL Report, the staff finds the applicant’s AMR results to be acceptable.

3.4.2.1.2 Loss of Preload Due to Stress Relaxation, Gasket Creep, or Self Loosening

During the audit and review, the staff noted that for VEGP AMR items 1c of LRA Table 3.4.2-1; 1b of LRA Tables 3.4.2-2, 3.4.2-3, and 3.4.2-4; and 1c of LRA Table 3.4.2-5, the applicant provides its AMRs on management of loss of preload due to stress relaxation, gasket creep, or self loosening in carbon steel S&PC bolting under exposure to an air indoor (exterior) environment. The applicant has credited its Bolting Integrity Program to manage loss of material in surfaces of the bolting components that are exposed to the air indoor (exterior) environment. The applicant uses a standard Note E for these AMR line items that roll up to the LRA Table 3.4.1, Item 22. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program.

The GALL AMR Item (VIII.H-5) that pertains to these VEGP AMR items that roll up to the LRA Table 3.4.1, Item 22, recommends GALL AMP XI.M18, “Bolting Integrity,” for managing these aging effects while the LRA uses the Bolting Integrity Program, which is a plant specific program. The staff reviewed the applicant’s Bolting Integrity Program, and the staff’s evaluation is documented in SER Section 3.0.3.3.2. During the audit and review, the staff agreed with the applicant’s determination that these LRA line items are consistent with the GALL Report, except using a plant specific AMP. On the basis of the staff’s evaluation of the AMP and the staff’s determination that the applicant’s AMR results are consistent with the GALL Report, the staff finds the applicant’s AMR results to be acceptable.

3.4.2.1.3 Loss of Material Due to General, Pitting, and Crevice Corrosion (Item 2)

During the audit and review, the staff noted that for VEGP AMR items 2b, 7b, and 12b of LRA Table 3.4.2-1, the applicant provides its AMRs for managing loss of material due to general, pitting, and crevice corrosion in surfaces of aluminum alloy oil reservoir actuators, filter housing actuators, and valve bodies in the main steam system that are exposed to an air – outdoor (exterior) environment. The applicant credits its External Surfaces Monitoring Program to manage loss of material in the component surfaces that are exposed to the air – outdoor (exterior) environment. The applicant uses a standard Note E for these AMR line items that roll up to the LRA Table 3.5.1, Item 50. 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 or NUREG-1801 identifies a plant specific aging management program.

The GALL AMR Item (III.B2-7) that pertains to these VEGP AMR items recommends that the Structures Monitoring Program (GALL AMP XI.S6) be used to manage loss of preload due to thermal effects, gasket creep, and self loosening in steel (including carbon steel) bolting surfaces that are exposed to uncontrolled indoor air environment while the LRA uses the External Surfaces Monitoring Program.

The staff asked the applicant to clarify whether or not any exceptions taken in its External Surfaces Monitoring Program against the recommended program elements in GALL AMP XI.M36, “External Surfaces Monitoring," are applicable to the AMRs for these components, and if so, justify why these exceptions are acceptable to manage loss of material in these components.

In its response, the applicant stated:

> LRA Table 3.4.2-1, Items 2b, 7b, and 12b, align to GALL Report III.B2-7 because there are no items in GALL section IV, V, VII, or VIII for this material and environment combination. Plant specific note 402 was applied to Item 2b to address this issue, and should have also been applied to Items 7b and 12b. In addition, Table 3.5.1, Item 3.5.1-50, does not discuss the mechanical components which refer to that item.
>
> As described in Note E for Items 2b, 7b, and 12b (LRA Table 3.4.2-1), consistency with GALL Report III.B2-7 and Table 3.5.1-50 is maintained for the material, environment, and aging effect. However, a different aging management program is credited, the External Surfaces Monitoring Program in lieu of the Structures Monitoring Program.
>
> The literature indicates that aluminum resists corrosion due to the presence of a thin aluminum oxide film covering the surface. Therefore, according to the EPRI Mechanical Tools (TR-1010639), an aggressive environment consisting of a wetted surface or pooled liquid, oxygen, and contaminants must be present for corrosion to occur in aluminum. The ARV local actuator filter housing exterior surfaces are subjected to an air - outdoor (exterior) environment in which the potential for atmospheric moisture exists. However, atmospheric moisture does not provide a significant source of contaminants. There is also no operating experience at VEGP which presents a case for significant loss of material for aluminum in an air - outdoor (exterior) environment. However, SNC has taken a conservative position to manage any effects of loss of material on the aluminum filter housings with the External Surfaces Monitoring Program. The External Surfaces Monitoring Program is a program especially designed to inspect external surfaces of mechanical system components in external air environments such as the aluminum alloy ARV local actuator filter housings. The Structural Monitoring Program is designed to inspect structural components, not mechanical components. Therefore, the External Surfaces Monitoring Program is the appropriate program to manage the components listed in LRA Table 3.4.2-1, Items 2b, 7b, and 12b.
>
> The VEGP External Surfaces Monitoring Program takes exception to GALL AMP XI.M36 in that additional materials such as aluminum used for the components in question will be included within the scope of inspections.
>
> This is considered an exception since the GALL AMP is described as being applicable to steel components only.

A License Renewal Application amendment is required to add plant specific note 402 where it was omitted, and to revise Table 3.5.1, Item 3.5.1-50, to discuss the mechanical components.

The staff confirmed that in its letter dated March 20, 2008, the applicant amended the LRA as stated above to add plant specific note 402 in LRA Table 3.4.2-1, for Items 7b, and 12b, and to revise Table 3.5.1, Item 3.5.1-50, to discuss the mechanical components. The staff finds the applicant's response and the amended aging management basis is acceptable because it stated that VEGP External Surfaces Monitoring Program is designed to inspect external surfaces of mechanical system components made of aluminum in external air environments such as the aluminum alloy ARV local actuator filter housings and this provides an acceptable basis for crediting the External Surfaces Monitoring activities as an alternate aging management basis.

The staff has evaluated the ability of the applicant's External Surfaces Monitoring Program (LRA AMP B.3.8) to manage loss of material in aluminum alloy components and its evaluation is described in SER Section 3.0.3.2.5. Based on the review, the staff finds the applicant's AMR results to be acceptable.

3.4.2.1.4 Loss of Material Due to General, Pitting, and Crevice Corrosion (Item 3)

During the audit and review, the staff noted that for VEGP AMR Item 5a of LRA Table 3.4.2-2 and AMR items 3a and 5a of LRA Table 3.4.2-5, the applicant provides its AMRs for managing loss of material due to general, pitting, and crevice corrosion in surfaces of carbon steel piping components and valve components in the main steam and auxiliary steam systems that are exposed to an air – indoor (interior) environment. For these components, the applicant credits its One-Time Inspection Program to manage loss of material in the component surfaces that are exposed to the air – indoor (interior) environment. The applicant uses a standard Note E for these AMR line items that roll up to the LRA Table 1 Item 3.2.1-32. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program.

The GALL AMR Item (V.A-19) that pertains to these AMR items recommends that GALL AMP XI.M38, "Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components," be used to manage loss of material due to general, pitting, and crevice corrosion in steel components surfaces that are exposed to the air – indoor (interior) environment.

The staff asked the applicant to clarify whether or not any exceptions taken in its One-Time Inspection Program against the recommended program elements in GALL AMP XI.M32, "One-Time Inspection," are applicable to this AMR, and if so, justify why these exceptions are acceptable to manage loss of material in carbon steel piping and valve body components.

In its response, the applicant stated that:

> VEGP LRA Table 3.4.2-5, items 3a and 5a, for Steam and Power Conversion System "Auxiliary Steam System" were aligned to GALL Table V.A, Item V.A-19, for Engineered Safety Features System "Containment Spray System," because there are no GALL AMR lines in either Chapter VIII, "Steam and Power Conversion System," or Chapter VII, "Auxiliary Systems," which evaluate the combination of carbon steel piping exposed to an "Air - Indoor (Interior)" environment. GALL Table V.A, Item V.A-19, is a match to VEGP LRA Table 3.4.2-5, items 3a and 5a, for component, material, environment, and aging effect requiring management. VEGP chose to credit a different aging management program than GALL for these components.
>
> For carbon steel piping components and valve bodies exposed to an Air - Indoor (Internal) environment where condensation or wetting are not present, some loss of material due to general corrosion is expected. However, VEGP expects the degree of corrosion for this material and environment combination to be minor and to progress slowly. VEGP believes that a one-time inspection will confirm this expectation, and that additional inspections will not be warranted. If the one-time inspection indicates that corrosion of this material and environment combination has progressed such that the intended function of a component could be affected during the period of extended operation, then the impacted components will be included in the Piping and Duct Internal Inspection Program, or other program as appropriate. Carbon steel components exposed to condensation, wetting, or Air - Outdoor (Internal) are managed by the Piping and Duct Internal Inspection Program because the potential for exposure to water negates the expectation that corrosion would progress slowly.
>
> The VEGP One-Time Inspection Program does not contain any exceptions to the recommended program elements in GALL AMP XI.M32, "One-Time Inspection."

The staff finds the applicant’s response and that the amended aging management basis is acceptable because the applicant has provided clarification that loss of material due to general corrosion for carbon steel piping components and valve bodies when exposed to an air - indoor (internal) environment where condensation or wetting are not present is expected to be minor and to progress slowly. The absence of any loss of material is verified by the applicant’s One-Time Inspection Program. The staff evaluated the ability of One-Time Inspection Program (LRA AMP B.3.17), to manage loss of material due to general, pitting and crevice corrosion in carbon steel components that are exposed to an indoor air (interior) environments and its evaluation is provided in SER Section 3.0.3.1.2.

3.4.2.1.5 Loss of Material Due to General, Pitting, and Crevice Corrosion (Item 4)

During the audit and review, the staff noted that for VEGP AMR Item 7a of LRA Table 3.4.2-3, the applicant provides its AMRs for managing loss of material due to general, pitting, and crevice corrosion in the carbon steel heat exchanger components in the steam generator blowdown processing system that are exposed to a raw water – river water (interior) environment. For these components, the applicant credits its Periodic Surveillance and Preventative Maintenance Program to manage loss of material in the component surfaces that are exposed to the raw water – river water (interior) environment.

The applicant uses a standard Note E for this AMR line item that roll up to the LRA Table 1 Item 3.4.1-31. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program.

The GALL AMR Item (VIII.F-5) that pertains to this AMR item recommends that GALL AMP XI.M20, "Open-Cycle Coolant Water System," be used to manage loss of material due to general, pitting, and crevice corrosion in steel components surfaces that are exposed to the air – indoor (interior) environment.

The staff asked the applicant to provide the basis why the Periodic Surveillance and Preventative Maintenance Activities are valid, sufficient, and capable of managing loss of material in these components in lieu of crediting the inspections that would be performed in accordance with the program elements for the VEGP Generic Letter 89-13 Program.

In its response, the applicant stated:

> NRC Generic Letter 89-13 is applicable to "the system or systems that transfer heat from safety-related structures, systems, or components to the UHS." For VEGP, Generic Letter 89-13 only applies to the Nuclear Service Cooling Water (NSCW) System. The environment in the NSCW System is "raw water - NSCW." The steam generator blow down (SGBD) trim heat exchanger is not part of, nor is it cooled by, the NSCW System. Therefore this component is not in the scope of the VEGP Generic Letter 89-13 Program.
>
> The SGBD trim heat exchanger is a non-safety related component which is cooled by the non-safety related Turbine Plant Cooling Water (TPCW) System. The environment in the TPCW System is "raw water - river water." Since the Generic Letter 89-13 Program is not applicable to this component, VEGP credited Periodic Surveillance and Preventive Maintenance Activities for aging management. As noted in Appendix B to the LRA, section B.3.21, a program for periodic inspection of the SGBD trim heat exchanger on each unit already exists. These components are visually inspected in accordance with procedure 83321-C for fouling, corrosion, coating failure, and structural/mechanical damage. These inspections are similar to inspections that would be performed under the Generic Letter 89-13 Program. VEGP operating experience with these inspections indicates that they are sufficient and capable to manage loss of material of the SGBD trim heat exchangers.

The staff finds the applicant's response and the amended aging management basis to be acceptable because the applicant provided clarification that the inspections performed under the Periodic Surveillance and Preventative Maintenance Activities Program are the type of inspections that would be performed under the Generic Letter 89-13 Program, and this provides an acceptable basis for crediting the Periodic Surveillance and Preventative Maintenance Activities as an alternate aging management basis. The staff evaluated the ability of the Periodic Surveillance and Preventative Maintenance Activities Program (LRA AMP B.3.21) to manage loss of material due to general, pitting and crevice corrosion in carbon steel heat exchanger component surfaces that are exposed to raw water – river water environment and its evaluation is provided in SER Section 3.0.3.3.6.

3.4.2.1.6 Loss of Material Due to General, Pitting, and Crevice Corrosion (Item 5)

During the audit and review, the staff noted that for VEGP AMR Item 15b of LRA Table 3.4.2-4, the applicant provides its AMRs for managing loss of material due to general, pitting, and crevice corrosion in the carbon steel tanks in the auxiliary feedwater system that are exposed to an air – outdoor (exterior) environment. For these components, the applicant's credits its External Surfaces Monitoring Program to manage loss of material in the tank surfaces that are exposed to the air – outdoor (exterior) environment. The applicant uses a standard Note E for this AMR line item that roll up to the LRA Table 1 Item 3.4.1-20. Note E states (LRA Table 3.0-4) that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but a different aging management program is credited or the GALL Report identifies a plant-specific aging management program.

The GALL AMR Item (VIII.G-40) that pertains to these AMR items recommends that GALL AMP XI.M29, "Aboveground Steel Tanks," be used to manage loss of material due to general, pitting, and crevice corrosion in steel components surfaces that are exposed to the air – outdoor (external) environment.

The staff asked the applicant to discuss how the program elements for the External Surfaces Monitoring Program compare to the NRC's recommended program elements in GALL AMP XI.M29 and identify any differences and justify the use of the External Surfaces Monitoring Program to manage the loss of material aging effect.

In its response, the applicant stated:

> GALL AMP XI.M29, "Aboveground Steel Tanks," uses a combination of coating of the external surfaces of a tank, sealing of the tank to foundation interface, external visual inspections of accessible portions of a tank and of the tank to foundation interface, and thickness measurements to identify any external corrosion of the inaccessible portions of a tank bottom.
>
> VEGP has taken the conservative position of not crediting coatings for aging management. However, VEGP agrees that observation of the condition of the paint or coating is an effective method for identifying degradation of the underlying material. Therefore, monitoring of the condition of coatings will be included in the inspection criteria of the External Surfaces Monitoring Program along with the inspection criteria to monitor for degradation of the component materials. Refer to the response to question B.3.8-02 for additional discussion.
>
> The CST degasifier tank addressed in LRA Table 3.4.2-4, Item 15b, is a vertical cylindrical tank supported by a skirt. This tank is insulated. There is no tank to foundation interface. The bottom of the tank is accessible for visual inspection, so the GALL program elements related to sealing of the tank to foundation interface, external visual inspections of the tank to foundation interface, and thickness measurements of the tank bottom to identify external degradation are not applicable to this tank.
>
> The remaining elements of the GALL Aboveground Steel Tanks program consist of external visual inspections of the accessible portions of the tank. These elements

are included in the VEGP External Surfaces Monitoring Program, therefore VEGP believes that this program will adequately manage loss of material from the CST degasifier tank during the period of extended operation.

The staff finds the applicant's response and that the amended aging management basis is acceptable because it provided clarification that the inspection attributes for managing the aging effects of CST degasifier tank is consistent with GALL AMP XI.M29. The staff has evaluated the ability of the applicant's External Surfaces Monitoring Program (LRA AMP B.3.8) to manage loss of material due to general, pitting and crevice corrosion in carbon steel tank component surfaces that are exposed to an air – outdoor (exterior) environment and its evaluation is provided in SER Section 3.0.3.2.5.

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 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 their 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

In LRA Section 3.4.2.2, the applicant further evaluated aging management, as recommended by the GALL Report, for the steam and power conversion (S&PC) 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-influenced corrosion, and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion
- cracking due to SCC
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and microbiologically-influenced corrosion
- loss of material due to general, pitting, crevice, and galvanic corrosion
- QA 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 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 defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1).

The applicant identified that for those S&PC components requiring metal fatigue analyses, the fatigue analyses are addressed in Section 4.3.2 of the LRA. The staff verified that Table 3.4.1 includes applicable line item on metal fatigue of Non-Class 1 S&PC components, as stated in LRA AMR Item 3.4.1-1 and that LRA Section 4.3.2 contains the TLAA and metal fatigue analysis section for Non-Class 1 S&PC components at VEGP. Thus, the staff noted that the applicant's further evaluation assessment in LRA Section 3.4.2.2.1 conforms to the staff's recommendations in SRP-LR Section 3.4.2.2.1 and that the LRA includes AMR Item 3.4.1-1 that corresponds to this further evaluation item. The staff verified that AMR Item 3.4.1-1 is consistent with and conforms to the staff recommended AMR evaluation in AMR Item 1 in Table 4 of the GALL Report, Revision 1, Volume 1. Based on this review, the staff concludes that the applicant's further evaluation discussion in LRA Section 3.4.2.2.1 is consistent with and conforms to the staff's corresponding evaluation recommendations in SRP-LR Section 3.4.2.2.1 and is acceptable. The staff also determined that the LRA includes AMR Item 3.4.1-1 on metal fatigue of S&PC components, and that this AMR is consistent with the recommendations in Table 4 of the GALL Report, Revision 1, Volume 1.

The staff reviewed the applicant's TLAA on metal fatigue and its evaluation of the TLAA on metal fatigue is provided in SER Section 4.3 and its subsections.

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 criteria in SRP-LR Section 3.4.2.2.2:

(1) LRA Section 3.4.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in steel piping and components, tanks, and heat exchangers exposed to treated water and steel piping and components exposed to steam as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of the water chemistry control program. Consistent with GALL Report AMPs XI.M2 and XI.M32), the Water Chemistry Control Program and the One-Time Inspection Program will manage such loss of material for carbon steel components exposed to treated water.

    SRP-LR Section 3.4.2.2.2, Item (1) 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 selected 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.

SRP-LR Item 3.4.2.2.2, Item (1) invokes Items 2, 3, 4, and 6 in Table 4 of the GALL Report, Revision 1, Volume 1. Collectively, AMR Items 2, 3, 4, and 6 in Table 4 of the GALL Report, Revision Volume 1, reference that AMR items VIII.B1-11, VIII.C-7, VIII.D1-8, VIII.E-34, VIII.E-37, VIII.E40, VIII.F-25 VIII.F-28, VIII.G-38, and VIII.G-41 of the GALL Report, Revision 1, Volume 2, are generic AMR items that may be applicable to the steel PWR piping, piping component, piping elements, tanks, and heat exchanger components in PWR main steam, extraction steam, feedwater, condensate, steam generator blowdown, and auxiliary feedwater systems under exposure to a treated water environment, and that AMR Item VIII.A-16 and VII.C.4 of the GALL Report, Revision 1, Volume 2, are generic AMR items for steel piping, piping component, and piping elements in PWR steam turbine and extraction steam systems under exposure to a steam environment. For these component-material-environment combinations, the GALL Report (like the SRP-LR) recommends that the Water Chemistry Program be credited to prevent or mitigate loss of material in the components and that a plant-specific program be credited to verify the effectiveness of the Water Chemistry Program in achieving its preventative or mitigative function.

Like the SRP-LR, the GALL AMRs identify that the One-time Inspection Program is an acceptable program to credit to verify the effectiveness of the applicant’s Water Chemistry Program.

The staff noted that the applicant did not include any Type 2 AMR items in LRA for steel piping, piping components, piping elements, tanks and heat exchanger components in the extraction steam systems that are exposed to treated water or steel piping, piping components, and piping elements in the extraction steam systems that are exposed to steam because the applicant does not include these systems within the scope of license renewal. The staff has evaluated the applicant’s basis for omitting these systems from the scope of the LRA and has provided its basis for concluding that the extraction steam and condensate systems do not need to be within the scope of license renewal in SER Section 2.4. Based on this finding, the staff concludes that the scope of the LRA does not need to include any AMR items aligning to GALL AMR items VIII.C-4 and VIII.C-7 for these extraction steam system components because the extraction steam systems are not within the scope of license renewal.

For the remaining steel piping, piping components, piping elements, tanks, and heat exchanger components in main steam, steam generator blowdown, auxiliary feedwater, and auxiliary steam systems that are exposed to treated water or steam, the staff reviewed LRA Tables. 3.4.2-1, 3.4.2.-3, 3.4.2-4, and 3.4.2-5 verified that the applicant's LRA includes applicable AMR line items that align to GALL AMR Items VIII.B1-11, VIII.F-25 VIII.F-28, VIII.G-38, and VIII.G-41. The staff also verified that the applicant has credited the Water Chemistry Program and One-Time Inspection to manage loss of material in these components. This is in conformance with the AMPs recommended for use in SRP-LR Section 3.4.2.2.2, Item (1) and in GALL AMR Items B1-11, VIII.F-25 VIII.F-28, VIII.G-38, and VIII.G-41. Based on this review, the staff concludes that the AMPs credited to manage loss of material in these components are in conformance with the staff's recommendations in SRP-LR Section 3.4.2.2.2, Item (1) and the GALL Report. Based on this assessment, the staff concludes that the applicant's AMRs on loss of material for the steel piping, piping components, piping elements, tanks, and heat exchanger components in main steam, steam generator blowdown, auxiliary feedwater, and auxiliary steam systems that are exposed to treated water or steam is acceptable because they are in conformance with the staff recommendations in SRP-LR Section 3.4.2.2.2, Item (1) and the GALL Report.

For the feedwater system, the staff reviewed Section 2.3.4 of the LRA and determined that the scope of the applicant's feedwater system is treated as one system at VEGP and which includes the following subsystems: (1) feedwater and condensate system, (2) condensate chemical injection system, and (3) moisture separator and reheater drain system. However, the LRA system drawings for the feedwater system demonstrate the condensate portions of this system are not within the scope of license renewal. The staff reviewed LRA Section 2.3.4 and the LRA boundary drawings for the feedwater system and determined that the scope of the LRA does not include any condensate system heat exchangers or tanks that are within the scope of license renewal but does include applicable piping, piping components, and piping elements (including flow orifices/elements, various piping components, and valve bodies) for these systems that are within the scope of license renewal. Therefore, based on this assessment, staff concludes that it is valid to conclude that the LRA does not need to include any AMR items that align to the staff recommendations in GALL AMRs VIII.E-37 and VIII.E-40 for management of loss of material in steel condensate system heat exchangers and tanks.

The staff verified that the applicant has aligned its AMR for the steel feedwater system piping, piping components, and piping elements that are exposed to treated water to the recommendations in GALL AMR VIII.D1-8 and has credited the Water Chemistry Program to manage loss of material in the components and the One-time Inspection Program to verify the effectiveness of the Water Chemistry Program to manage loss of material in the components. This is in conformance with the AMPs recommended for use in SRP-LR Section 3.4.2.2.2, Item (1) and in GALL AMR Item VIII.D1-8. Based on this review, the staff concludes that the AMPs credited to manage loss of material in these feedwater system components are the same as those recommended for aging management in the staff's recommendations of SRP-LR Section 3.4.2.2.2, Item (1) and the GALL Report.

Based on this assessment, the staff concludes that the applicant's AMRs for managing loss of material for the steel feedwater system piping, piping components, and piping elements that are exposed to treated water is acceptable because they are in conformance with the staff recommendations in SRP-LR

Section 3.4.2.2.2, Item (1) and the GALL Report.

The staff reviewed the ability of the Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion and its evaluation is described in SER Section 3.0.3.1.4. The staff reviewed the ability of the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program in managing loss of material due to general, pitting, and crevice corrosion and its evaluation of the One-Time Inspection Program is described in SER Section 3.0.3.1.2.

(2) LRA Section 3.4.2.2.2, Item (2) addresses loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements exposed to lubricating oil as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of lubricating oil controls in managing corrosion. Consistent with GALL Report AMPs with exceptions, the Oil Analysis Program and the One-Time Inspection Program will manage loss of material for cast iron and carbon steel components exposed to lubricating oil.

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 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.

SRP-LR Item 3.4.2.2.2, Item (2) identifies AMR Item 7 in Table 4 of the GALL Report, Revision 1, Volume 1, and AMR items VIII.D1-6, VIII.E-32, and VIII.G-35 as generic AMR items that may be applicable to steel piping, piping components, and piping elements in the feedwater, condensate and auxiliary steam systems under exposure to a lubricating oil environment. Like SRP-LR Section 3.4.2.2.2, Item (2), GALL AMRs VIII.D1-6, VIII.E-32, and VIII.G-35 recommend that the Lubricating Oil Analysis Program be credited to manage loss of material that may occur in the surfaces of these components that are exposed to the lubricating oil environment and that a plant-specific program be credited to verify the effectiveness of the Lubricating Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion.
Like SRP-LR Section 3.4.2.2.2, Item (2), GALL AMRs VIII.D1-6, VIII.E-32, and VIII.G-35 identify that the One-Time Inspection Program is an acceptable program to verify the effectiveness of the Lubricating Oil Analysis Program.

The staff reviewed LRA Section 2.3.4 and determined that, for the LRA, the scope of the feedwater system bounds the following systems: (1) condensate and feedwater system, (2) condensate chemical injection system, and (3) moisture separator and reheater drain system. However, the LRA system drawings for the feedwater system demonstrate the condensate portions of this system are not within the scope of license renewal. The staff reviewed LRA Section 2.3.4 and the LRA boundary drawings for the feedwater system and determined that the scope of the LRA does not include any condensate system piping, piping components, and piping elements (including flow orifices/elements, various piping components, and valve bodies) that are within the scope of license renewal or any feedwater piping, piping components, or piping elements that are exposed to a lubricating oil environment. Therefore, based on this review, the staff concludes that this is a valid basis for not including AMRs in LRA Table 3.4.2-2, "Feedwater System – Summary of Aging Management Reviews," that corresponds to GALL AMR Item VIII.D1-6 or VIII.E-32.

The staff also verified that the VEGP design includes the following auxiliary feedwater system components or commodity groups that are fabricated from steel materials and are exposed to a lubricating oil environment:

- filter housings
- piping components
- turbine driven auxiliary feedwater pump lubricating oil reservoirs
- turbine driven auxiliary feedwater lubricating oil pump casings
- valve bodies

For these components or commodity groups, the staff verified that the applicant has aligned its AMRs for these components or commodity groups to GALL AMR VIII.G-35 and credited the Oil Analysis Program to manage loss of material due to general, pitting, or, crevice corrosion in the surfaces that are exposed to the lubricating oil environment The staff also verified that the applicant has credited the One-Time Inspection Program to verify the effectiveness the Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion in the component surfaces that are exposed to lubricating oil. These are the same AMPs that are recommended for management in SRP-LR Section 3.4.2.2.2, Item (2) and in GALL AMR Item VIII.G-35.

Based on this review, the staff concludes that the applicant's AMRs on loss of material due to general, pitting, and crevice corrosion for the components surfaces of the piping, piping components, and piping elements that are exposed to lubricating oil is in conformance with the staff's recommendation in the SRP-LR and in the GALL Report. Based on this assessment, the staff concludes that the applicant's AMR for the turbine driven auxiliary feedwater pump lube oil cooler heat exchanger tubes is acceptable because it is in conformance with the recommendations of SRP-LR Section 3.4.2.2.2, Item (2) and GALL AMR Item VIII.G-35.

The staff reviewed the ability of Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion and its evaluation is described in SER Section 3.0.3.2.10. The staff reviewed the ability of the One-Time Inspection

Program to verify the effectiveness of the Oil Analysis Program in managing loss of material due to general, pitting, and crevice corrosion and its evaluation of the One-Time Inspection Program is described in SER Section 3.0.3.1.2.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.2 criteria or has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.2 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item. For those line items that apply to LRA Section 3.4.2.2.2, the staff concludes that the LRA is consistent with the SRP-LR and 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 loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling in steel piping components exposed to raw water as an aging effect not applicable to VEGP. The AMR methodology predicts loss of material for steel piping components exposed to raw water, but AMR results for S&PC systems do not include steel piping components exposed to raw water. LRA Item 3.4.1-31 addresses S&PC system steel heat exchanger components exposed to raw water. LRA Section 3.3 addresses interfacing raw water systems.

SRP-LR Section 3.4.2.2.3 states that loss of material due to general, pitting, and crevice corrosion, and microbiologically-influenced corrosion, and fouling may occur in steel piping, piping components, and piping elements exposed to raw water.

SRP-LR Item 3.4.2.2.3 identifies AMR Item 8 in Table 4 of the GALL Report, Revision 1, Volume 1, and AMR Item VIII.G-36 in the GALL Report, Revision 1, Volume 2, as generic AMRs for the surfaces of steel piping, piping component, piping elements in the auxiliary feedwater system that are exposed to a raw water environment. In these AMR items, the GALL states that loss of material due to general corrosion, pitting corrosion, crevice corrosion, or microbiologically-influenced corrosion may occur in the surfaces of these steel components that are exposed to the raw water environment and recommends that is to be evaluated and credited to manage this aging effect.

The staff reviewed UFSAR Section 10.4.9 of the Votgle UFSAR, Auxiliary Feedwater System and determined that the normal flow for VEGP auxiliary feedwater systems is from the CST to the auxiliary feedwater pumps and that the systems do not include any piping, piping components, or piping elements that are exposed to a raw water environment. Based on this review, the staff concludes that the applicant has provided an acceptable basis for concluding the recommendations of SRP-LR Section 3.4.2.2.3 and GALL Item VIII.G-36 are not applicable to the VEGP LRA because the scope of the auxiliary feedwater system does not include any piping, piping components or piping elements that are exposed to a raw water environment.

Based on the above, the staff concludes that the applicant has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.3 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item.

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.4.2.2.4 against the criteria in SRP-LR Section 3.4.2.2.4:

(1) LRA Section 3.4.2.2.4 addresses reduction of heat transfer due to fouling in stainless steel and copper alloy heat exchanger tubes exposed to treated water as an aging effect for which the GALL Report recommends a one-time inspection to verify the effectiveness of the water chemistry control program. Consistent with GALL Report AMPs, the Water Chemistry Control Program and the One-Time Inspection Program will manage reduction of heat transfer for heat exchanger tubes so exposed.

SRP-LR Section 3.4.2.2.4, Item (1) 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.

SRP-LR Item 3.4.2.2.4, Item (1) identifies that AMR Item 9 in Table 4 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.E-10, VIII.E-13, VIII.F-7, VIII.F-10, and VIII.G-10 in the GALL Report, Revision 1, Volume 2, are generic AMR items for stainless steel and copper heat exchanger tubes in the condensate, steam generator blowdown, and auxiliary feedwater systems that are exposed to a treated water environment. In these AMRs, the GALL states that reduction of heat transfer as a result of fouling may occur in the surfaces of stainless steel or copper heat exchanger tubes under exposure to the treated water environment. Like SRP-LR Section 3.4.2.2.4, Item (1), these GALL AMRs recommend that Water Chemistry Program be credited to manage this aging effect and that a plant-specific AMP be evaluated and credited to verify that the effectiveness of the Water Chemistry Program to manage reduction or heat transfer due to fouling of these stainless steel and copper heat exchanger tubes. Like SRP-LR Section 3.4.2.2.4, Item (1), these GALL AMRs identify that the One-Time Inspection Program is an acceptable AMP to credit for the verification of the effectiveness of the Water Chemistry Program.

To assess whether the LRA needed to address any relevant heat exchanger tubes in the feedwater system, the staff reviewed LRA Section 2.3.4 and determined that the feedwater system is within the scope of license renewal and that scope of the feedwater system bounds the following systems: (1) condensate and feedwater system, (2) condensate chemical injection system, and (3) moisture separator and reheater drain system. The staff concludes that Section 2.3.4 of the LRA indicates that these systems do not include any passive heat exchanger components that are within the scope of license renewal and are subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1). Based on this finding, the staff concludes that the scope of the LRA does not need to include any AMR items aligning to GALL AMR Item VIII.E-10 (as applicable copper heat exchanger tubes in the condensate system) and VIII.E-13 (as applicable to stainless steel heat exchanger tubes in the condensate system) because the feedwater systems (including its subsystems identified above) do not include any heat exchangers that are with the scope of license renewal and are subject to an AMR.

The staff reviewed LRA Section 3.4.2.1.3 and the AMR items in LRA Table 3.4.2-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," to assess whether the LRA needed to address any relevant heat exchanger tubes in the steam generator blowdown processing system under this SRP-LR item. Based on its review, the staff concludes that, while the steam generator blowdown processing system is within the scope of license renewal and does include steam generator blowdown heat exchangers and trim heat exchangers, the shells, tubesheets, and tubes in the heat exchangers are made from carbon steel. Thus, none of the components in these heat exchangers are made for copper alloy or stainless steel materials. Therefore, based on this assessment, the staff finds that it is valid to conclude that the application does not need to include any AMRs corresponding to either GALL AMR Item VIII.F-7 (as applicable copper heat exchanger tubes in the steam generator blowdown system) and VIII.F-10 (as applicable to stainless steel heat exchanger tubes in the steam generator blowdown system) because the steam generator blowdown processing heat exchangers and trim heat exchangers do not have either copper or stainless steel heat exchanger tubes.

The staff has verified that the applicant does include appropriate AMR items on loss of material of the steel shells and channel heads for the steam generator blowdown processing system heat exchangers and trim heat exchangers, and that the applicant has aligned these AMR items to GALL AMR VIII.F-28. In these AMRs, the applicant credits the Water Chemistry Program to manage loss of material of the steel heat exchanger shells and channel heads and the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program in managing this aging effect. These AMPs are the same AMPs as those recommended for aging management in GALL AMR VIII.F-28. Based on this review, the staff concludes that the AMPs credited to manage loss of material in these components are acceptable because they are in conformance with the staff's AMPs recommended for aging management in GALL AMR Item VIII.F-28. The staff reviewed the ability of the Water Chemistry Program to manage loss of material due to general, pitting, and crevice corrosion and its evaluation is described in SER Section 3.0.3.1.4. The staff reviewed the ability of the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program in managing loss of material due to general, pitting, and crevice corrosion and its evaluation of the One-Time Inspection Program is described in SER Section 3.0.3.1.2.

The staff also reviewed LRA Section 3.4.4 and the AMR items in LRA Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," to assess whether the LRA needed to address any relevant heat exchanger tubes in the auxiliary feedwater system under this SRP-LR item, as invoking GALL AMR Item

VIII.G-10 for copper heat exchanger tubes in the auxiliary feedwater system that are exposed to a treated water environment. Based on its review of LRA Section Table 3.4.2-4, the staff concludes that the VEGP auxiliary feedwater systems do not include any heat exchangers whose tubes are fabricated from copper or copper alloy materials. Based on this assessment, the staff finds that it is valid to conclude that the application does not need to include any AMRs corresponding to either GALL AMR Item VIII.G-10 (as applicable to reduction of heat transfer function in copper heat exchanger tubes of the auxiliary feedwater system under exposure to treated water) because the design of the auxiliary feedwater system does not include any heat exchangers whose tubes are fabricated from copper or copper alloy materials.

(2) LRA Section 3.4.2.2.4 addresses reduction of heat transfer due to fouling in stainless steel and copper alloy heat exchanger tubes exposed to lubricating oil, stating that GALL Report recommends lube oil chemistry control and a confirmatory one-time inspection. Consistent with GALL Report AMPs with exceptions, the Oil Analysis Program and the One-Time Inspection Program will manage fouling of lubricating oil cooler heat-transfer surfaces.

SRP-LR Section 3.4.2.2.4, Item (2) 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 selected 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.

SRP-LR Item 3.4.2.2.4, Item (2) identifies that AMR Item 10 in Table 4 of the GALL Report, Revision 1, Volume 1, and AMR Items VIII.G-8, VIII.G-12, and VIII.G-15 of the GALL Report, Revision 1, Volume 2, are generic AMR items for copper, stainless steel and steel heat exchanger tubes in the auxiliary feedwater system that are exposed to a lubricating oil environment. In these AMRs, the GALL Report states that reduction of heat transfer as a result of fouling may occur in the surfaces of the copper, stainless steel, or steel heat exchanger tubes that are exposed to the lubricating oil environment. Like SRP-LR Section 3.4.2.2.4, Item 2, these GALL AMRs recommend that Lubricating Oil Analysis Program be credited to manage this aging effect and that a plant-specific AMP be evaluated and credited to verify that the Lubricating Oil Analysis Program is achieving its mitigative function to manage reduction or heat transfer due to fouling of copper, stainless steel and copper heat exchanger tubes in the auxiliary feedwater system. These GALL AMRs identify that the One-Time Inspection Program is an acceptable AMP to credit for the verification of the effectiveness of the Lubricating Oil Analysis Program.

The staff verified that only heat exchanger tubes that align to GALL AMRs VIII.G-8, VIII.G-12, or VIII.G-15 are those for the turbine driven auxiliary feedwater pump lube oil cooler heat exchanger tubes and that these tubes are fabricated from stainless steel materials. The staff also verified that the applicant has aligned its AMR for the turbine driven auxiliary feedwater pumps lube oil heater exchanger tubes to GALL AMR Item VIII.G-12, which is the corresponding AMR on reduction of heat transfer function for stainless steel heat exchanger tubes in the auxiliary feedwater system that are exposed to a lubricating oil environment. The staff verified that the applicant has credited its Oil Analysis Program to manage reduction of heat transfer function due to fouling of the turbine driven auxiliary feedwater pumps lube oil heater exchanger tubes and its One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program to manage reduction of heat transfer function due to fouling in the turbine driven auxiliary feedwater pumps lube oil heater exchanger tubes.

These are the same AMPs that are recommended for management in SRP-LR Section 3.4.2.2.4, Item (2) and in GALL AMR Item VIII.G-12.

Based on this review, the staff concludes that the applicant's AMR on reduction of heat transfer function for the surfaces of the turbine driven auxiliary feedwater pump lube oil cooler heat exchanger tubes is in conformance with the staff's recommendation in the SRP-LR and in the GALL Report. Based on this assessment, the staff concludes that the applicant's AMR for the turbine driven auxiliary feedwater pump lube oil cooler heat exchanger tubes is acceptable because it is in conformance with the recommendations of SRP-LR Section 3.4.2.2.4, Item (2) and GALL AMR Item VIII.G-12.

The staff reviewed the ability of Oil Analysis Program to manage loss of material due to general, pitting, and crevice corrosion and its evaluation is described in SER Section 3.0.3.2.10. The staff reviewed the ability of the One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program in managing loss of material due to general, pitting, and crevice corrosion and its evaluation of the One-Time Inspection Program is described in SER Section 3.0.3.1.2.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.4 criteria or has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.4 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item. For those line items that apply to LRA Section 3.4.2.2.4, the staff concludes that the LRA is consistent with the SRP-LR and 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 criteria in SRP-LR Section 3.4.2.2.5:

(1) LRA Section 3.4.2.2.5 addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in steel piping components and tanks exposed to soil as an aging effect not applicable to VEGP. The AMR methodology

predicts loss of material for steel piping components exposed to soil, but AMR results for S&PC systems do not include steel components so exposed.

SRP-LR Section 3.4.2.2.5, Item (1) states that loss of material due to general, pitting, and crevice corrosion, and microbiologically-influenced corrosion may occur in 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, Item (1) states that the detection of aging effects and operating experience is to be further evaluated and that either the Buried Piping and Tanks Surveillance Program or the Buried Piping and Tanks Inspection Program is an acceptable program to credit for management of loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in the component surfaces that are exposed to a soil environment (with or without an associated coating wrapping).

SRP-LR Item 3.4.2.2.5, Item (1) identifies that AMR Item 11 in Table 4 of the GALL Report, Revision 1, Volume 1, and AMR Items VIII.E-1 and VIII.G1 of the GALL Report, Revision 1, Volume 2, are generic AMR items for the surfaces of steel piping, piping components, piping elements, and tanks in the condensate and auxiliary feedwater systems that are exposed to a soil environment (with or without an associated coating wrapper). In these AMRs, the GALL Report states that loss of material due to general, pitting, crevice, or microbiologically-influenced corrosion may occur in the steel component surfaces that are exposed to a soil environment. Like SRP-LR Section 3.4.2.2.5, Item (1), these GALL AMRs identify that the detection of aging effects and operating experience is to be further evaluated and that either the Buried Piping and Tanks Surveillance Program or the Buried Piping and Tanks Inspection Program is an acceptable program to credit for management of loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in the component surfaces that are exposed to a soil environment (with or without an associated coating wrapping).

Section 2.3.4 of the LRA identifies that, for the LRA, the VEGP feedwater system category includes the following systems and subsystems: The staff noted that the applicant includes its Type 2 AMR items in LRA for steel piping components or tanks in the condensate systems within the scope of its AMRs for the feedwater system. The staff reviewed UFSAR Section 10.4.10 and verified that the applicant treats the condensate and feedwater system as one interconnected system at VEGP. The staff reviewed Table 3.4.2-2, “Feedwater System – Summary of Aging Management Results,” and determined that the table does identify that the condensate/feedwater system includes buried piping components whose external surfaces are exposed to a soil environment; however, the staff verified that the material of fabrication for these piping is stainless steel not steel (including carbon steel, alloy steels, and cast iron materials). The applicant has appropriately aligned its AMR for these buried pipe components to GALL AMR VIII.E-28, which provides the staff’s generic AMR recommendations for management of loss of material due in stainless steel condensate piping that is exposed to a soil environment. The applicant credited its Buried Piping and Tanks Inspection Program to manage loss of material in this buried stainless steel piping components. The staff verified that this is consistent with the program that is recommended for aging management in GALL AMR VIII-E28, and that this is the same program that the NRC recommends for management if the buried piping were fabricated from steel materials and GALL

AMR VIII-E-1 was applicable to the components. Based on this review, the staff concludes that the Buried Piping and Tanks Inspection Program is acceptable to manage loss of material in the buried stainless steel condensate/feedwater piping because the program is consistent with the program recommended for aging management in GALL AMR VIII.E-28. Based on this finding, the staff concludes that the scope of the LRA does not need to include any AMR items aligning to GALL AMR Item VIII.E-1 because the buried condensate/feedwater piping at VEGP is not fabricated from steel materials.

The staff verified that the scope Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," and determined that the AMRs in Table 3.4.2-4 do not include any auxiliary feedwater system piping, piping components, piping elements, or tanks that are exposed to a soil environment. The staff reviewed Chapter 10 of the VEGP UFSAR and determined that the UFSAR does not provide any design information indicating the auxiliary feedwater systems include portions of the systems that are subject to an external buried soil environment. Based on this determination, the staff verified that the auxiliary feedwater system does not include piping, piping components, piping elements, or tanks that are exposed to a buried soil environment. Based on assessment, the staff concludes that the LRA does not need to include any AMRs that correspond to GALL AMR Item VIII.G-1 because the auxiliary feedwater system does not include steel piping, piping components, piping elements, and tanks that are exposed to a soil environment, and thus, AMR Items VIII.G-1 is not applicable to the VEGP design.

(2) LRA Section 3.4.2.2.5 addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in steel heat exchanger components exposed to lubricating oil as an aging effect not applicable to VEGP. The AMR methodology predicts loss of material for steel heat exchanger components exposed to lube oil, but AMR results for S&PC systems do not include steel heat exchanger components so exposed.

SRP-LR Section 3.4.2.2.5, Item (2) states that loss of material due to general, pitting, and crevice corrosion, and microbiologically-influenced corrosion may occur in steel heat exchanger components exposed to lubricating oil. SRP-LR Section 3.4.2.2.5, Item (2) states that the existing aging management program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. SRP-LR 3.4.2.2.5, Item (2) states, however, that control of lube oil contaminants may not always have been adequate to preclude corrosion and that therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion is not occurring. SRP-LR Section 3.4.2.2.5, Item (2) states that 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 selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

SRP-LR Item 3.4.2.2.5, Item (2) invokes AMR Item 12 in Table 4 of the GALL Report, Revision 1, Volume 1 and AMR Item VIII.G6 of the GALL Report, Revision

1, Volume 2, as generic AMR recommendations for steel heat exchanger components in the auxiliary feedwater system that are exposed to a lubricating oil environment. In these AMRs, the GALL Report states that loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion may occur in the steel component surfaces that are exposed to a lubricating oil environment. Like SRP-LR Section 3.4.2.2.5, Item (2), these GALL AMRs identify that the detection of aging effects and operating experience is to be further evaluated and that the Lubricating Oil Analysis Program is an acceptable program to manage loss of material that may occur in the surfaces of these steel heat exchanger components that are exposed to a lubricating oil environment. These AMRs also state that a plant-specific AMP be credited to verify the effectiveness of the Lubricating Oil Analysis Program in managing loss of material in the component surfaces that are exposed to the lubricating oil environment. Like SRP-LR Section 3.4.2.2.5, Item (2), these GALL AMRs identify that the One-Time Inspection Program is an acceptable AMP to credit for verification of the effectiveness of the Lubricating Oil Analysis Program.

The staff reviewed LRA Section 3.4.2.1.4 and LRA Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," and verified that the applicable heat exchanger components in the auxiliary feedwater system are those for the turbine driven auxiliary feedwater pump lube oil cooler tubes, shells, and tubesheets, and that at VEGP, these heat exchanger components are fabricated from stainless steel materials in stead of steel materials (i.e., the components are not fabricated from carbon steel, alloy steel or cast iron materials). Based on this review, the staff concludes that SRP-LR Section 3.4.2.2.5, Item (2) and GALL AMR Item VIII.G-6 are not applicable to the VEGP LRA because these heat exchanger components are not fabricated from steel materials. Based on this assessment, the staff concludes that the LRA does not need to include any AMRs for the turbine driven auxiliary feedwater pump lube oil cooler tubes, shells, and tubesheets that correspond to GALL AMR Item VIII.G-6 because the turbine driven auxiliary feedwater pump lube oil cooler tubes, shells, and tubesheets at VEGP are fabricated from stainless steel materials and not from steel materials. The staff has verified that the applicant has included AMRs on loss of material of the stainless steel turbine driven auxiliary feedwater pump lube oil cooler tubes, shells, and tubesheets in the LRA and has aligned these AMRs to SRP-LR Section 3.4.2.2.8 and to GALL AMR Item VIII.G-3. The staff evaluated these AMR items in SER Section 3.4.2.2.8.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.4.2.2.5 criteria or has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.5 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item. The staff concludes that the LRA is consistent with the SRP-LR and 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).

3.4.2.2.6 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 due to SCC in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60 ºC (140 ºF) as an aging effect for which the GALL Report recommends the water chemistry control program with a confirmatory one-time inspection. Consistent with GALL Report AMPs, the Water Chemistry Control Program and the One-Time Inspection Program will manage cracking for stainless steel components so exposed.

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 selected 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.

SRP-LR Section 3.4.2.2.6 identifies that AMR Item 14 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.B1-5, VIII.C-2, VIII.D1-5, VIII.E-30, VIII.E-38 VIII.F-3, VIII.F-24, and VIII.G-33 are generic AMR items that may be applicable to stainless steel PWR piping, piping components, piping elements, tanks, and heat exchanger components in the main steam, extraction steam, feedwater, condensate, steam generator blowdown, and auxiliary feedwater systems that are exposed to a treated water greater than 60 ºC (140 ºF) environment. In these AMRs, the GALL Report states that cracking due to SCC may occur in the stainless steel component surfaces that are exposed to a treated water greater than 60 ºC (140 ºF) environment. Like SRP-LR Section 3.4.2.2.6, these GALL AMRs identify that the detection of aging effects and operating experience is to be further evaluated and that the Water Chemistry Program is an acceptable program to manage cracking due to SCC that may occur in the surfaces of these stainless steel piping and tank components that are exposed to a treated water greater than 60 ºC (140 ºF) environment. These AMRs also state that a plant-specific AMP be credited to verify the effectiveness of the Water Chemistry program in managing cracking due to SCC in the component surfaces that are exposed to a treated water greater than 60 ºC (140 ºF) environment. Like SRP-LR Section 3.4.2.2.6, these GALL AMRs identify that the One-Time Inspection Program is an acceptable AMP to credit for verification of the effectiveness of the Water Chemistry Program.

In Section 3.4 of the LRA, the applicant only identifies that cracking due to SCC as an applicable aging effect for stainless steel components that are exposed to a treated water environment if the operating temperature of the environment is greater than 60 ºC (140 ºF). This is acceptable because the practice is consistent with the thresholds for initiation of SCC in Table IX of the GALL Report, Revision 1, Volume 2. The staff noted that the applicant did not include any Type 2 AMR items in LRA for steel piping components or tanks in the extraction steam systems that are exposed to a treated water greater than 60 ºC (140 ºF) environment because the applicant does not include the VEGP extraction steam systems within the scope of license renewal. The staff has evaluated the applicant's basis for omitting the extraction steam systems from the scope of the LRA and has provided its basis for concluding that the extraction steam systems do not need to be within the scope of license renewal in SER Section 2.4. Based on this finding, the staff concludes that the scope of the LRA does not need to include any AMR items aligning to GALL AMR Item VIII.C-2 on cracking of stainless steel piping components in the extraction steam systems because the applicant has provided an acceptable basis for omitting the VEGP extraction steam and condensate systems from the scope of the VEGP LRA.

The staff reviewed LRA Table 3.2.4-1, "Main Steam System – Summary of Aging Management Review," and LRA Table 3.4.2-2, "Feedwater System Summary of Aging Management Review," and verified that the VEGP design includes the following main steam system and feedwater system components or commodity groups that are fabricated from stainless steel materials and are exposed to a treated water greater than 60 ºC (140 ºF) environment:

- piping components
- flow orifices/flow elements
- valve bodies

For these components or commodity groups, the staff verified that the applicant has aligned its AMRs for the main steam system to GALL AMR VIII.B-5 and its AMRs for the feedwater/condensate system to GALL AMR VIII.D-5 (which provides staff-developed recommendations for feedwater piping equivalent to those in GALL VIII.E-30 and VIII.E-38 for condensate components, as based on equivalent material-environment-aging effect conditions). In these AMRs, that the applicant credited the Water Chemistry Program to manage cracking of these stainless steel components. The staff also verified that the applicant has credited the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program in managing cracking due to SCC in stainless steel component surfaces that are exposed to the treated water greater than 60 ºC (140 ºF) environment. The staff concludes that this is acceptable because these AMPs are the same AMPs recommended for aging management as those recommended in GALL AMRs VIII.B-5 and VIII.D-5.

The staff reviewed LRA Tables 3.2.4-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," and 3.2.4-4, "Auxiliary Feedwater System – Summary of Aging Management Review," and determined that the AMRs in these tables did not include any components or commodity groups that are exposed to a treated water greater than 60 ºC (140 ºF) environment. Based on this review, the staff finds that it is valid to conclude that the applicant does not need to include any AMRs in the LRA aligning to GALL AMRs VIII.F-3, VIII.F-24, and VIII.G-33 because the treated water environment is less than the threshold for initiation of SCC-induced cracking of stainless steel materials stated in Table IX of GALL Volume 2. Based on this assessment, the staff concludes that the LRA does not need to include any AMRs that align to GALL AMRs VIII.F-3, VIII.F-24, or VIII.G-33, as applicable stainless steel PWR piping, piping components, piping elements, tanks, and heat exchanger components in the steam generator blowdown, and auxiliary feedwater systems because the treated water temperature for any stainless steel piping, piping components, tanks, or heat exchanger components is less than 60 ºC (140 ºF) and therefore below the staff's threshold for SCC-induced cracking for stainless steel materials.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.6 criteria or has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.6 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item. For those line items that apply to LRA Section 3.4.2.2.6, the staff concludes that the LRA is consistent with the SRP-LR and 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 criteria in SRP-LR Section 3.4.2.2.7:

(1) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion for stainless steel, aluminum, and copper alloy piping, piping components, and piping elements for stainless steel tanks and heat exchanger components exposed to treated water as an aging effect for which the GALL Report recommends the water chemistry control program with a confirmatory one-time inspection. Consistent with GALL Report AMPs, the Water Chemistry Control Program and the One-Time Inspection Program will manage loss of material for stainless steel and aluminum alloy components so exposed. Aluminum alloy components included in this further evaluation section are located in the sampling system in the auxiliary systems group, not in an S&PC system. AMR results for S&PC systems do not include copper alloy components exposed to treated water.

    SRP-LR Section 3.4.2.2.7, Item (1) 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 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.

    For aluminum and copper alloy components, SRP-LR Section 3.4.2.2.7 Item (1) identifies that AMR Item 15 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.A-5. VIII.D1-1, VIII.E-15, VIII.F-12, VIII.F-15, and VIII.G-17 in the GALL Report, Revision 1, Volume 2, are generic AMR items that may be applicable to copper or aluminum PWR piping, piping components, or piping elements in the steam turbine, feedwater, condensate, steam generator blowdown, and auxiliary feedwater systems that are exposed to a treated water environment. For stainless steel components, SRP-LR Section 3.4.2.2.7 Item (1) identifies that AMR Item 16 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.B1-4. VIII.C-1, VIII.D1-4, VIII.E-4, VIII.E-29, VIII.E-36, VIII.F-23, VIII.F-27, and VIII.G-32 are generic AMR items that may be applicable to stainless steel PWR piping, piping components, piping elements, tanks, and heat exchanger components in the main steam, extraction steam, feedwater, condensate, steam generator blowdown, and auxiliary feedwater systems that are exposed to a treated water environment. In these AMRs, the GALL Report states that loss of material due to pitting or crevice corrosion may occur in component surfaces that are exposed to a treated water environment. Like SRP-LR Section 3.4.2.2.7, Item (1), these GALL AMRs identify that the detection of aging effects and operating experience is to be further evaluated and that the Water Chemistry Program is an acceptable program to manage loss of material due to pitting or crevice corrosion that may occur in the copper or aluminum component surfaces that are exposed to a treated water environment. These AMRs also recommend that a plant-specific AMP be credited to verify the effectiveness of the Water Chemistry program in managing loss of material due to pitting or crevice corrosion in the component surfaces that are exposed to the treated water environment. Like SRP-LR Section 3.4.2.2.7, Item (1), these GALL AMRs identify that the One-Time Inspection Program is an acceptable AMP to credit for verification of the effectiveness of the Water Chemistry Program.

The staff reviewed LRA Section 3.4 and LRA Tables 3.4.2-1, "Main Steam System – Summary of Aging Management Review," 3.4.2-2, "Feedwater System – Summary of Aging Management Review," 3.4.2-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," and 3.4.2-5, "Auxiliary Steam System – Summary of Aging Management Review," and verified that the VEGP design does not include any copper alloy or aluminum alloy piping, piping components, piping elements in the main steam (including steam turbine system), feedwater (including condensate, condensate chemical injection, and moisture separator heater and drain line systems), steam generator blowdown processing system, auxiliary feedwater, and auxiliary steam systems that are exposed to a treated water environment. Based on this assessment, the staff concludes that the applicant's LRA does not need to include AMRs aligning to GALL AMR items VIII.A-5. VIII.D1-1, VIII.E-15, VIII.F-12, VIII.F-15, and VIII.G-17 because the main steam, feedwater, steam generator processing, auxiliary feedwater, and auxiliary steam systems do not include any copper alloy or aluminum alloy piping, piping components, or piping elements that are exposed to a treated water environment.

The staff reviewed LRA Section 3.4 and LRA Tables 3.4.2-1, "Main Steam System – Summary of Aging Management Review," 3.4.2-2, "Feedwater System – Summary of Aging Management Review," 3.4.2-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," and 3.4.2-5, "Auxiliary Steam System – Summary of Aging Management Review," and verified that the VEGP design does include one or more of the following type of piping, piping components, piping elements, tanks, and heat exchanger components in the main steam (including steam turbine system), feedwater (including condensate, condensate chemical injection, and moisture separator heater and drain line systems), steam generator blowdown processing system, auxiliary feedwater, and auxiliary steam systems that are exposed to a treated water environment and align to either GALL AMR VIII.B1-4. VIII.C-1, VIII.D1-4, VIII.E-4, VIII.E-29, VIII.E-36, VIII.F-23, VIII.F-27, and VIII.G-32:

- piping components
- valve bodies
- flow orifices/elements
- filter housings
- pump casings
- oil coolers
- tank liners
- steam traps

The staff reviewed the applicant's AMRs for these components and verified that the applicant credited the Water Chemistry Program to manage loss of material due to pitting and crevice corrosion in the surfaces of the stainless steel components or commodity groups that are exposed to the treated water environment. The staff also verified that the applicant credited its One-Time Inspection Program to confirm the effectiveness of the Water Chemistry Program in managing loss of material in these components. Based on this review, the staff confirmed that the AMPs credited by the applicant to manage aging in these stainless steel components are the same AMPs are those recommended for aging management in SRP-LR Section 3.4.2.2.7, Item (1) and in GALL AMR Items VIII.B1-4, VIII.C-1, VIII.D1-4, VIII.E-4, VIII.E-29, VIII.E-36, VIII.F-23, VIII.F-27, and VIII.G-32. Based on this assessment, the staff concludes that the applicant's AMRs for managing loss of material due to pitting and crevice corrosion in these stainless steel components is acceptable because it is in conformance with the recommendations of SRP-LR Section 3.4.2.2.7, Item (1) and the applicable AMRs in the GALL Report.

The staff noted that the applicant did not include any Type 2 AMR items in LRA for stainless steel piping, piping, components, piping element, tanks, or heat exchanger components in the extraction steam systems that are exposed to a treated water environment because the applicant does not include the VEGP extraction steam systems within the scope of license renewal. The staff has evaluated the applicant's basis for omitting the extraction steam systems from the scope of the LRA and has provided its basis for concluding that the extraction steam systems do not need to be within the scope of license renewal in SER Section 2.4. Based on this finding, the staff concludes that the scope of the LRA does not need to include any AMR items aligning to GALL AMR Item VIII.C-1 on loss of material due to pitting or crevice corrosion in stainless steel extraction steam piping, piping components, and piping elements because the applicant has provided an acceptable basis for omitting the VEGP extraction steam systems from the scope of the VEGP LRA.

(2) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil as an aging effect to be managed by the Buried Piping and Tanks Inspection Program for buried surfaces of these piping components consistently with GALL AMP XI.M34 with exceptions.

SRP-LR Section 3.4.2.2.7, Item (2) 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.

SRP-LR Section 3.4.2.2.7, Item (2) identifies that AMR Item 17 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.E-28 and VIII.G-31 in the GALL Report, Revision 1, Volume 2, are generic AMR items that may be applicable for stainless steel piping, piping components, and piping elements in PWR condensate and auxiliary feedwater systems that are exposed to a soil environment. Like SRP-LR Section 3.4.2.2.7, Item (2), these GALL AMRs identify that loss of material due to pitting and crevice corrosion is an applicable aging effect for the surfaces of the stainless steel condensate and auxiliary feedwater system piping, piping component, and piping elements that are exposed to a soil environment. The GALL Report recommends that a plant-specific be evaluated and credited. Like SRP-LR Section 3.4.2.2.7, Item (2), these GALL AMRs recommend that a plant-specific AMP be evaluated and credited to manage any loss of material that may occur in these components as a result of pitting or crevice corrosion.

The staff reviewed LRA Table 3.4.2-2, "Feedwater System – Summary of Aging Management Review," which includes rolled up AMRs for components in the feedwater, condensate, condensate chemical injection, and moisture separator reheater and drain line systems, and determined that GALL AMR VIII.E-28 is applicable to the VEGP design and that the LRA does include a AMR that aligns to GALL AMR VIII.E-28 on management of loss of material due to pitting and crevice corrosion in the surfaces of feedwater/condensate piping, piping components, and piping elements that are exposed to a soil environment. The staff verified that, in its AMR, the applicant evaluated a plant-specific AMP for aging management and that the applicant opted to credit its Buried Piping and Tanks Inspection Program (LRA AMP B.3.4) to manage loss of material in the surfaces of the stainless steel feedwater/condensate piping that are exposed to a soil environment. The staff verified that the applicant's Buried Piping and Tanks Inspection Program is a program whose program elements are consistent with the staff recommended program element criteria in GALL AMP XI.M34, "Buried Piping and Tanks Inspection," without exception and that the scope of the applicant's program includes, but is not limited to, the following piping that this exposed externally to a soil environment:

- feedwater system (buried condensate piping between the condensate storage tanks and condenser hotwells)

Based on this analysis, the staff concludes that the applicant has credited a valid AMP to manage loss of material due to pitting and crevice corrosion in these piping components because the scope of the AMP that is credited by the applicant for aging management includes that applicable stainless steel condensate piping and because the applicant's program is based on the NRC's recommendations in GALL AMP XI.M34, "Buried Piping and Tanks Inspection." The staff evaluated the ability of LRA AMP B.3.4, "Buried Piping and Tanks Inspection Program, to manage loss of material in buried piping and its evaluation is described in SER Section 3.0.3.2.2.

(3) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion for copper alloy piping, piping components, and piping elements exposed to lubricating oil as an aging effect not applicable to VEGP. The AMR methodology predicts loss of material for copper alloy components exposed to lube oil, but AMR

results for S&PC systems do not include copper alloy piping components so exposed.

SRP-LR Section 3.4.2.2.7, Item (3) 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 aging management program relies on the periodic sampling and analysis of 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 have been adequate to preclude corrosion. Therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion is not occurring. 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 selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

SRP-LR Section 3.4.2.2.7, Item (3) identifies that AMR Item 18 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.A-3, VIII.D1-2, VIII.E-17, and VIII.G-19 in the GALL Report, Revision 1, Volume 2, are generic AMR items that may be applicable for cooper alloy piping, piping components, and piping elements in PWR steam turbine, feedwater, condensate, and auxiliary feedwater systems under exposure to a lubricating oil environment. Like SRP-LR Section 3.4.2.2.7, Item (3), these GALL AMRs identify that loss of material due to pitting and crevice corrosion is an applicable aging effect for the surfaces of copper components that are exposed to a lubricating oil environment. Like SRP-LR Section 3.4.2.2.7, Item (3), these GALL AMRs identify that the detection of aging effects is to be evaluated and recommends that a plant-specific AMP be evaluated and recommend that the Lubricating Oil Analysis Program be credited to manage any loss of material that may occur in these components as a result of pitting or crevice corrosion and that the One-Time Inspection Program be credited to verify the effectiveness of the Lubricating Oil Analysis Program in managing loss of material in the component surfaces that are exposed to lubricating oil.

The staff reviewed LRA Section 3.4 and LRA Tables 3.4.2-1, "Main Steam System – Summary of Aging Management Review," 3.4.2-2, "Feedwater System – Summary of Aging Management Review," 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," and 3.4.2-5, "Auxiliary Steam System – Summary of Aging Management Review," and verified that the VEGP S&PC systems do not include any copper alloy components. Based on this review, the staff finds that it is valid to conclude that SRP-LR Section 3.4.2.2.7, Item (3) is not applicable to the design of the VEGP S&PC systems. Based on this assessment, the staff concludes that the LRA does not need to include any AMRs aligning to GALL AMRs VIII.A-3, VIII.D1-2, VIII.E-17, and VIII.G-19 because the VEGP S&PC systems do not include copper alloy components.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.7 criteria or has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.7 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item. For those line items that apply to LRA Section 3.4.2.2.7, the staff concludes that the LRA is consistent with the SRP-LR and 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 loss of material due to pitting, crevice, and microbiologically-influenced corrosion in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil as an aging effect for which the GALL Report recommends lube oil chemistry control and a confirmatory one-time inspection. Consistent with GALL Report AMPs with exceptions, the Oil Analysis Program and the One-Time Inspection Program will manage the aging effect.

SRP-LR Section 3.4.2.2.8 states that loss of material due to pitting and crevice corrosion, and microbiologically-influenced corrosion 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 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.

SRP-LR Section 3.4.2.2.8 identifies that AMR Item 19 in the GALL Report, Revision 1, Volume 1, and AMR Items VIII.A-9, VIII.D1-3, VIII.E-26, VIII.G-3, and VIII.G-29 in the GALL Report, Revision 1, Volume 2, are generic AMR items that may be applicable for stainless steel piping, piping components, piping elements, and heat exchanger components in PWR steam turbine, feedwater, condensate, and auxiliary feedwater systems under exposure to a lubricating oil environment. Like SRP-LR Section 3.4.2.2.8, these GALL AMRs identify that loss of material due to pitting corrosion, crevice corrosion and microbiologically-influenced corrosion is an applicable aging effect for the surfaces of the stainless steel components that are exposed to a lubricating oil environment. Like SRP-LR Section 3.4.2.2.8, these GALL AMRs identify that the detection of aging effects is to be evaluated and recommend that the Lubricating Oil Analysis Program be credited to manage any loss of material that may occur in these components as a result of pitting, corrosion, crevice corrosion or microbiologically-influenced corrosion, and that the One-Time Inspection Program be credited to verify the effectiveness of the Lubricating Oil Analysis Program in managing loss material in the component surfaces that are exposed to a lubricating oil environment.

The staff reviewed LRA Tables 3.4.2-1, “Main Steam System – Summary of Aging Management Review,” 3.4.2-2, “Feedwater System – Summary of Aging Management Review, and 3.4.2-5, “Auxiliary Steam System – Summary of Aging Management Review,” and determined that the applicant does not identify any stainless steel piping, piping components, piping elements, or heat exchanger components in the main steam, feedwater/condensate and auxiliary steam system that are exposed to a lubricating oil environment. Based on this review, the staff concludes that it is valid to conclude that the LRA does not need to include any AMRs aligning to GALL AMRs VIII.A-9, VIII.D1-3, and VIII.E-26 because the applicant does not have any stainless steel piping, piping components, piping elements, or heat exchanger components in these systems that are exposed to lubricating oil. The staff has noted that the applicant conservatively treats organic-based hydraulic fluid as an environmental equivalent as lubricating oil that the applicant did identify that the main steam system does include some stainless steel hydraulic fluid oil reservoirs, piping components, and valve bodies whose internal surfaces are exposed to a hydraulic fluid environment.

The staff noted that, while the applicant did not align its AMRs on loss of material for these components to GALL AMR VIII.A-9, the applicant did identify that loss of material due to pitting corrosion, crevice corrosion and microbiologically-influenced corrosion is an applicable aging effect for the surfaces that are exposed to the organic-based hydraulic fluid environment. For these AMRs, the staff verified that the applicant credits its Oil Analysis Program to manage loss of material that may occur in the component surfaces as a result of to pitting corrosion, crevice corrosion and microbiologically-influenced corrosion, and the One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program in managing loss of material in the components. The staff considers this to be consistent with the staff’s recommendation in GALL AMR VIII.A-9 because the hydraulic fluid is an organic-based oil and creates the same type of environmental conditions as that of lubricating oil. Based on this review, the staff concludes that the applicant’s programs for managing loss of material in the surfaces of the stainless steel main steam system components that are exposed to hydraulic fluid are acceptable because the hydraulic fluid is conservatively treated to have the same type of environmental conditions as lubricating oil and because the AMPs credited by the applicant are the same programs as those recommended for aging management in GALL AMR VIII.A-9.

The staff reviewed LRA Table 3.4.2-4, “Auxiliary Feedwater System – Summary of Aging Management Review, has verified that the applicant’s LRA does include an AMR on loss of material for the surfaces of stainless steel turbine driven auxiliary feedwater pump oil and an AMR on loss of material of stainless steel auxiliary feedwater system piping for the component surfaces that are exposed to a lubricating oil environment. The staff verified that, in these AMRs, the applicant credited the Oil Analysis Program to manage loss of material in the component surfaces that are exposed to the lubricating oil environment and the One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program is managing loss of material in these components. The staff reviewed the staff’s recommendations in GALL AMRs VIII.G-3 and VIII.G-29 and determined that the programs credited by the applicant are consistent with the programs recommended for aging management in GALL AMR VIII.G-3 and VIII.G-29.

Based on this review, the staff concludes that the applicant's programs for managing loss of material in the surfaces of the stainless steel turbine driven auxiliary feedwater pump oil cooler components and piping components that are exposed to lubricating oil are acceptable because they are the same programs as those recommended for aging management in GALL AMR VIII.G-3 and VIII.G-29.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.8 criteria or has provided an acceptable basis for demonstrating the SRP-LR Section 3.4.2.2.8 criteria do not apply to the relevant VEGP system or systems addressed by the specific SRP-LR item. For those line items that apply to LRA Section 3.4.2.2.8, the staff concludes that the LRA is consistent with the SRP-LR and 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).

3.4.2.2.9 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 general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water in BWRs as an aging effect not applicable to VEGP, a PWR plant.

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 aging management program relies on monitoring and control of 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 of stagnant flow conditions. Therefore, the effectiveness of the water chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the water chemistry control program. A one-time inspection of select components and susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

SRP-LR Section 3.4.2.2.9 identifies that AMR Item 5 in the GALL Report, Revision 1, Volume 1, and AMR Item VIII.E-7 in the GALL Report, Revision 1, Volume 2, are generic AMR items that may be applicable for steel heat exchanger components in BWR condensate systems under exposure to a treated water environment. VEGP is a PWR-designed facility. Thus, SRP-LR 3.4.2.2.9 is not applicable to the VEGP LRA.

Based on the above, the staff concludes that the SRP-LR Section 3.4.2.2.9 criteria is not applicable to the VEGP LRA because VEGP is a PWR designed facility.

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.

3.4.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.4.2-1 through 3.4.2-5, 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 3.4.2-1 through 3.4.2-5, 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.

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 Steam System - Summary of Aging Management Review –
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 steam system component groups. The staff's evaluation of the plant-specific AMR results (i.e., AMR results that are not consistent with the GALL Report or not addressed in the GALL Report) for the main steam system are described in the subsections that follow:

3.4.2.3.1.1 AMRs for Management of Loss of Material in Aluminum, Stainless Steel, and Carbon Steel Main Steam System Components Under Exposure to a Lubricating Oil Environment

LRA Table 3.4.2-1, "Main Steam System – Summary of Aging Management Review," includes the following plant-specific AMR items for aluminum, stainless steel, and carbon steel components in the main steam system that are exposed to a hydraulic fluid environment:

- aluminum filter housings – ARV local (manual actuators)
- stainless steel oil reservoirs – ARV local (manual actuators)
- carbon steel pump casings – ARV manual hand pumps
- carbon steel and stainless steel piping components
- aluminum, carbon steel, and stainless steel valve bodies

In these AMR items, the applicant identifies that loss of material is an applicable aging effect requiring management (AERM) for the surfaces that are exposed to the hydraulic fluid environment. In these AMRs, the applicant credits the Oil Analysis Program (LRA AMP B.3.16) to manage loss of material in the component surfaces that are exposed to hydraulic fluid environment. The applicant also credited its One-Time Inspection Program to verify that loss of material has not occurred in the component surfaces that are exposed to hydraulic fluid and to verify that the applicant's Oil Analysis Program is accomplishing its mitigative management function.

Table 4 in the GALL Report, Revision 1, Volume 1 includes applicable AMR item recommendations for managing loss of material due to pitting and crevice corrosion in stainless steel and carbon steel steam and power conversion (S&PC) components that are exposed to a lubricating oil environment:

- AMR Item 3.4.1-12 for steel materials (including carbon steels, alloy steels, and cast irons) exposed to lubricating oil

- AMR Item 3.4.1-19 for stainless steel materials exposed to lubricating oil

In these AMRs, the staff recommends that GALL AMP XI.M39, "Lubricating Oil Analysis Program," be credited to manage loss of material due to pitting and crevice corrosion in the component surfaces that are exposed to lubricating oil and that a plant-specific AMP be credited to verify the effectiveness of the Lubricating Oil Analysis Program. The staff verified that the applicable GALL AMR items indicate that the One-Time Inspection Program is a valid program to credit for verification of the effectiveness of the Lubricating Oil Analysis Program.

The applicant has credited its Oil Analysis Program (AMP B.3.16) to manage loss of material due to pitting and crevice corrosion in the carbon steel and stainless steel components that are exposed to a hydraulic fluid environment, and has credited its One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program. The staff reviewed the LRA and verified that the Oil Analysis Program is the applicant's AMP that corresponds to GALL AMP XI.M39, "Lubricating Oil Analysis Program," and that the scope of applicant's Oil Analysis Program conservatively includes aluminum alloy, stainless steel, and steel (including carbon steels, alloy steels and cast irons) components or commodity groups that are exposed to either a lubricating oil environment or a hydraulic fluid environment. The staff considers this is a conservatism in the applicant's program and a valid approach to aging management because: (1) both the lubricating oils and hydraulic fluids at VEGP are fabricated from organic oil compounds, and (2) the applicant's program is designed to ensure that water, ionic, and organic impurities are not occurring or are minimized in the VEGP lubricating oil and hydraulic fluid inventories and that these fluids will not lead to loss of material due to pitting or crevice in the components that are in contact with these organic-based fluids. Based on this assessment, the staff concludes the applicant's plant-specific AMR items for the carbon steel and stainless main steam system components that are exposed to hydraulic fluid are consistent with GALL AMRs 3.4.1-12 and 3.4.1-19, respectively, and are acceptable.

The applicant has also credited its Oil Analysis Program (AMP B.3.16) to manage loss of material due to pitting and crevice corrosion in the aluminum alloy components that are exposed to a hydraulic fluid environment, and has credited its One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program. Table 4 in the GALL Report, Revision 1, Volume 1, does not include any applicable AMR line items for managing aging in aluminum components that are exposed to a lubricating oil or organic hydraulic fluid environments. However, the staff considers the applicant's bases for managing loss of material due to pitting and crevice corrosion in these aluminum components to be acceptable because: (1) the aluminum alloy components in the applicant's AMRs include a passivating aluminum-oxide surface which protects the underlying aluminum portions of the components from corrosion, (2) the applicant's Oil Analysis Program is designed to ensure that water, ionic, and organic impurities are not occurring or are minimized in the VEGP lubricating oil and hydraulic fluid inventories and that these fluids will not lead to loss of material due to pitting or crevice in the metallic components (including aluminum, carbon steel, and stainless steel components) that are in contact with lubricating oil or hydraulic fluid environments, and (3) the applicant's bases for managing loss of material in the aluminum component surfaces that are in contact with hydraulic fluid is consistent the applicant's bases for managing loss of material in the carbon steel and stainless steel main steam system components that are exposed to hydraulic fluid. Thus, the staff considers the applicant's approach for managing loss of material / pitting and crevice corrosion in these aluminum components to be consistent with the AMPs that the staff recommends for managing loss of material / pitting and crevice corrosion in carbon steel and stainless steel components that are exposed to lubricating oil. Based on this assessment, the staff concludes that the applicant's basis for managing loss of materials in these aluminum components to be acceptable.

This basis is also applicable to the staff's acceptance of the applicant's AMRs for managing loss of material / pitting and crevice corrosion in the aluminum auxiliary feedwater system filter housings that are exposed to lubricating oil (SER Section 3.4.2.3.4.1 refers back to the evaluation in this section).

3.4.2.3.1.2 AMRs for Stainless Steel Main Steam System Components Under Exposure to either an Air - Outdoor (Interior) Environment or an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-1, "Main Steam System – Summary of Aging Management Review," includes the following plant-specific AMR items for stainless steel components or commodity groups that are exposed to either an air – outdoor (interior) environment or an air – outdoor (exterior) environment:

- flow orifices / elements – surfaces exposed to the air – outdoor (exterior) environment
- flow restrictors – ARV discharge paths – interior surfaces exposed to the air – outdoor (interior) environment
- flow restrictors – ARV discharge paths – exterior surfaces exposed to the air – outdoor (exterior) environment

- flow restrictors – ARV discharge paths – interior surfaces exposed to the air – outdoor (interior) environment

- flow restrictors – ARV discharge paths – interior surfaces exposed to the air – outdoor (exterior) environment

In these AMR items, the applicant did not identify any AERMs for the stainless steel components surfaces in contact with these environments.

The staff reviewed the GALL Report, Revision 1, Volumes 1 and 2, and determined that the GALL Report does not include any AMR items that identify applicable aging effects for stainless steel components that are exposed to outside air environments. The staff researched industry literature on aging of stainless steel materials and determined that, while the industry literature (refer to the web address at http://www.azom.com/details.asp?articleID=1177) does indicate that stainless steel materials can be subject to the effects of corrosion when exposed to specific environments (e.g., when exposed to environments strong acids, halogenated water, sulfide containing oils and gases), the literature does support the conclusion that stainless steel materials are resistant to the effects of corrosion when exposed to normal benign outside atmospheric environments (i.e, atmospheric environments not containing halogen-based of sulfur-based gaseous impurity species).

Based on this assessment, the staff concludes that it is valid to conclude that the stainless steel flow orifices, flow restrictors, and oil reservoirs addressed in these AMR items would not be subject to loss of material that could be induced corrosive mechanisms (such general corrosion, pitting corrosion, crevice corrosion, galvanic corrosion, etc.) or to cracking that could be induced by corrosive (such as stress corrosion cracking or intergranular attack), and that for these AMR items, the applicant has a valid basis for concluding that there are not any AERMs applicable to the exposure of these stainless steel components to either the air – outdoor (interior) environment or the air – outdoor (exterior) environment.

The staff's evaluation and basis provided in this section is also applicable to the staff's acceptance of the following plant-specific AMRs for steam and power conversion components:

- stainless steel flow orifices / elements, piping components, and valves bodies in the feedwater system that are exposed to the air – outdoor (exterior) environment (SER Section 3.4.2.3.2.1 refers back to the evaluation in this section)

- stainless steel flow orifices / elements, piping components, and valves bodies in the auxiliary feedwater system that are exposed to the air – outdoor (exterior) environment (SER Section 3.4.2.3.4.3 refers back to the evaluation in this section)

- stainless steel flow orifices / elements in the auxiliary steam system that are exposed to the air – outdoor (exterior) environment (SER Section 3.4.2.3.5.1 refers back to the evaluation in this section)

3.4.2.3.1.3 AMRs for Management of Loss of Material of Stainless Steel Main Steam System Components Under Exposure to an Air - Outdoor (Interior, Wetted) Environment

LRA Table 3.4.2-1, “Main Steam System – Summary of Aging Management Review,” includes the following plant-specific AMR item for stainless steel components or commodity groups that are exposed to either an air – outdoor (interior) environment or an air – outdoor (exterior) environment:

- flow orifices / elements – surfaces exposed to the air – outdoor (interior, wetted) environment

In this AMR item, the applicant identified that loss of material due to general pitting and crevice corrosion was an AERM for the component surfaces that are exposed to the air – outdoor (interior, wetted) environment and credited the One-Time Inspection Program to manage the aging effect. The GALL Report does not include a corresponding AMR item for exposure of stainless steel components to an outdoor air, wetted interior, environment.

The staff asked the applicant to justify why the One Time Inspection is considered to be a valid AMP for managing loss of material in the stainless steel flow orifices that are exposed to the air – outdoor (interior, wetted) environment and why similar aging effects are not applicable for stainless steel components exposed to an air - outdoor (exterior) environment.

In its response to the staff’s question, the applicant stated that stainless steel materials are not normally expected to corrode in these outdoor air environments, but added that the applicant’s AMR tool conservatively assumes that condensation or wetting is occurring in the internal stainless steel surfaces that are subject to outdoor air environment, and localized corrosion is postulated whenever interior condensation or wetted surfaces stressors are assumed. The applicant further stated that, for the stainless steel external surfaces that are in contact with outdoor air, the applicant considers rain, snow, and sleet to be intermittent occurrences of water and that, as such, these conditions are not assumed to result in a wetted or condensation stressor in the manner it was assumed for the internal stainless steel component surfaces.

Thus, for this AMR item, it is the internal surfaces of the flow orifices that are exposed to the outdoor air environment, and the applicant has conservatively assumed that condensation or wetting can occur on the internal surfaces of the flow orifices. Thus, while loss of material due to corrosive mechanisms is unlikely, the applicant has assumed that it does have a small probability of occurring and that it is appropriate for the One-Time Inspection Program to be credited to confirm either the loss of material due to corrosion is not occurring, or to propose corrective actions if the presence of corrosion is verified in the inside surfaces of the flow orifices. In the GALL Report, the staff included GALL AMP XI.M32, “One-Time Inspection Program,” for cases where an inspection-based AMP is necessary to verify the effectiveness of a mitigative-based AMP (e.g., to verify the effectiveness of a Water Chemistry Program or a Lubricating Oil Analysis Program) or else to provide additional assurance that aging that has not yet manifested itself, is not occurring, or that the evidence of aging shows that the aging is so insignificant that an aging management program is not warranted.

Thus, consistent with the GALL Report, the staff finds that the applicant is warranted in crediting the One-Time Inspection Program to manage loss of material in these flow orifices because it will be used to confirm that corrosion has not occurred in the internal surfaces that are exposed to the air – outdoor (interior, wetted) environment. Based on this review, the staff concludes the applicant's basis is acceptable because: (1) stainless steel flow orifice materials are designed to be resistant to general corrosion mechanisms in normal air environments, (2) although corrosion is not expected, the applicant has conservatively assumed that condensation or wetted conditions is occurring in the internal component surfaces that are exposed to the outdoor air environment, and that corrosion could possibly occur in these component surfaces, (3) the applicant has credited its One-Time Inspection Program to manage loss of material in the stainless steel internal surfaces that are exposed to the air - outdoor (interior, wetted) environment, and (4) the applicant's crediting of the One-Time Inspection Program is consistent with the objective for crediting one-time inspection programs for aging management, as stated in GALL AMP XI.M32, "One-Time Inspection." The staff has evaluated the ability of the One-Time Inspection Program to manage loss of material in components that are exposed to this environment, and its evaluation is described in SER Section 3.0.3.1.2. The staff's question is resolved.

3.4.2.3.1.4 AMRs for Management of Cracking of Stainless Steel Main Steam System Components Under Exposure to an Air - Outdoor (Interior, Wetted and Temperature (T) ≥ 60 ºF [T ≥ 140 ºF]) Environment

LRA Table 3.4.2-1, "Main Steam System – Summary of Aging Management Review," includes plant-specific AMR item for the following stainless steel components or commodity groups that are exposed to either an air – outdoor (interior, wetted and T ≥ 60 ºF [T ≥ 140 ºF]) environment or an air – outdoor (exterior) environment:

- flow orifices / elements – surfaces exposed to the air – outdoor (interior, wetted) environment

In this AMR item, the applicant identified that cracking due to stress corrosion cracking (SCC) was an AERM for the component surfaces that are exposed to the air – outdoor (interior, wetted, T ≥ 140 ºF) environment and credited the One-Time Inspection Program to manage the aging effect. The GALL Report does not include a corresponding AMR item for exposure of stainless steel components to an air – outdoor (interior, wetted and T ≥ 60 ºF [T ≥ 140 ºF]) environment.

The staff asked the applicant to justify why the One Time Inspection is considered to be a valid AMP for managing cracking in the stainless steel flow orifices that are exposed to the air – outdoor (interior, wetted and T ≥ 60 ºF [≥ 140 ºF]) environment and why similar aging effects are not applicable for external stainless steel component surfaces that are exposed outdoor air.

In its response to the staff's question, the applicant stated that stainless steel materials are not normally expected to corrode in these outdoor air environments, but added that the applicant's AMR tool conservatively assumes that condensation or wetting is occurring on the internal stainless steel flow orifice surfaces and that the internal operating temperature for the orifices is assumed to be in excess of 60 ºC (i.e., in excess of 140 ºF). The applicant further stated that, under these assumptions, the AMR tool conservatively assumes that stress corrosion cracking, while not expected, could potentially occur in the surfaces that are exposed to this interior, T > 60 ºC (> 140 ºF) outdoor air environment. The applicant stated that, under this assumption, it is valid to credit the One-Time Inspection Program to confirm that stress corrosion cracking is not occurring in the internal component surfaces that are exposed to the outdoor air.

In Table IX.D of the GALL Report, Revision 1, Volume 2, the staff uses 60 ºC (> 140 ºF) as its threshold for initiation of stress corrosion cracking in stainless steel materials and identifies that stress corrosion cracking is an applicable aging effect for stainless steel materials when exposed to water with operating temperatures in excess of this temperature threshold. In the GALL Report, the staff also included GALL AMP XI.M32, "One-Time Inspection Program," for those cases where an inspection-based AMP is necessary to verify the effectiveness of a mitigative-based program (e.g., to verify the effectiveness of a Water Chemistry Program or a Lubricating Oil Analysis Program) or where additional assurance is necessary to verify that aging of a component has not yet manifested itself, has not occurred, or is so insignificant that an aging management program is not warranted.

Thus, consistent with the GALL Report, the staff finds that the applicant is warranted in crediting the One-Time Inspection Program to manage stress corrosion cracking in these stainless steel flow orifices because it will be used to confirm that stress corrosion cracking has not occurred in the internal surfaces that are exposed to the air – outdoor (interior, wetted, > 60 ºC [> 140 ºF]) environment. Based on this review, the staff concludes the applicant's basis is acceptable because: (1) stainless steel flow orifice materials are designed to be resistant to general corrosion mechanisms in normal outdoor air environments, (2) although stress corrosion cracking is not expected under this environment, the applicant has conservatively assumed a wetted > 60 ºC [> 140 ºF] condition is occurring in the internal component surfaces that are exposed to the outdoor air environment, and that stress corrosion cracking could possibly occur in these component surfaces, and (3) the applicant has credited its One-Time Inspection Program to manage stress corrosion cracking in the stainless steel internal surfaces that are exposed to this environment. The staff has evaluated the ability of the One-Time Inspection Program to manage loss of material in components that are exposed to this environment, and its evaluation is described in SER Section 3.0.3.1.2. The staff's question is resolved.

3.4.2.3.1.5 AMRs for Management of Loss of Loss of Material in Carbon Steel Main Steam System Components Under Exposure to an Air - Outdoor (Exterior, T ≥ 100 ºC[T ≥ 212 ºF]) Environment

LRA Table 3.4.2-1, "Main Steam System – Summary of Aging Management Review," includes plant-specific AMR items for the following carbon steel components or commodity groups that are exposed to an air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment:

- carbon steel piping components (including forged sections for five-way pipe restraints)

- carbon steel valve bodies

In these AMR items, the applicant identified that there are not any AERMs for the carbon steel component surfaces that are exposed to the air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment. Thus, the applicant did not credit any AMPs for aging management in the AMRs for these specific component commodity groups.

In Table A.3.2 of NUREG-1833, "Technical Bases for Revision of License Renewal Guidance Documents," the staff uses 100 ºC (212 ºF) as its threshold for concluding the condensation or wetting will not occur on the surface of a plant-specific component exposed to an air environment. The table establishes the staff's basis for concluding that condensate will not occur on the surfaces of components whose operating temperatures are equal or in excess of this temperature threshold, and that the components are expected to be in a dry condition. Based on this assessment, the staff finds the applicant's AMRs on these carbon steel components to be acceptable because it is in conformance with the staff's position taken in Table A.3.2 of NUREG-1833 and because at these operating temperatures, the staff does not anticipate water condensation to occur on the surfaces of the carbon steel piping components and valve bodies that are exposed to the air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment. Based on this assessment, the staff concludes that the applicant does not need to credit any AMPs for these plant-specific AMR items.

The staff's evaluation described previously in this section is applicable to the assessment of
plant-specific AMR items for carbon steel component surfaces that are exposed to an uncontrolled air environment (whether indoor or outdoor air) and operate at or above a temperature of 100 ºC (212 ºF) (e.g., T ≥ 100 ºC [T ≥ 212 ºF]). Thus, the staff's evaluation and basis described in this section is also applicable to the staff's evaluation of the following
plant-specific AMRs for carbon steel S&PC components that are exposed to either an air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment or an air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment:

- carbon steel piping and valve body components in the feedwater system (SER Section 3.4.2.3.2.2 refers back to the evaluation in this section)

- carbon steel piping components in the steam generator blowdown processing system (SER Section 3.4.2.3.3.1 refers back to the evaluation in this section)

- carbon steel piping, steam trap, and valve body components in the auxiliary steam system (SER Section 3.4.2.3.5.2 refers back to the evaluation in this section)

3.4.2.3.1.6 AMRs for Management of Loss of Pre-load in Carbon Steel Main Steam System Closure Bolting Under Exposure to an Air - Outdoor (Exterior) Environment and Stainless Steel Main Steam System Bolting Under Exposure to an Air - Indoor (Exterior) Environment

LRA Table 3.4.2-1, “Main Steam System – Summary of Aging Management Review,” includes the plant-specific AMR items for the following closure bolting items in the main steam system:

- carbon steel closure bolting under exposure to an air – outdoor (exterior) environment
- stainless steel closure bolting under exposure to an air – indoor (exterior) environment

In these plant-specific AMR items, the applicant identified that loss of preload is an aging effect requiring management (AERM) for the bolting components. The applicant credited its Bolting Integrity Program to manage loss of preload in these bolting components.

The applicant’s Bolting Integrity Program is described in LRA Section B.3.2 and is listed as a plant-specific AMP for the VEGP LRA. In this AMP, the applicant’s “parameters monitored or inspected” program element conservatively lists loss of preload as an aging effect that the program monitors for, and the applicant’s “detection of aging effects” program element defines that inspection techniques that will be used to monitor for this aging effect. The staff has evaluated the ability of the Bolting Integrity Program to manage loss of preload in the VEGP-specific S&PC bolting components and its evaluation is described in SER Section 3.0.3.3.2. Based on this review, the staff finds the applicant’s AMRs for these bolts to be acceptable because: (1) the applicant has conservatively identified that loss of preload is an AERM for these bolting components, (2) the applicant is crediting the program that the staff recommends for aging management of S&PC (including main steam system) bolting components, and (3) the applicant’s program includes appropriate criteria to monitor and manage loss of preload in these bolting components.

The staff’s evaluation described previously in this section is applicable to the assessment managing loss of preload in S&PC closure bolting that is exposed either to an air – indoor (exterior) environment or an air – outdoor (exterior) environment. Thus, the staff’s evaluation and basis described in this section is also applicable to the staff’s evaluation of the following plant-specific AMRs for S&PC closure bolting components that are exposed to either of these environments:

- carbon steel closure bolting in the feedwater system that is exposed to an air – outdoor (exterior) environment (SER Section 3.4.2.3.2.3 refers back to the evaluation in this section)
- carbon steel closure bolting in the steam generator blowdown processing system that is exposed to an air – indoor (exterior) environment (SER Section 3.4.2.3.3.3)
- carbon steel and stainless steel closure bolting in the auxiliary feedwater system that is exposed to an air – outdoor (exterior) environment (SER Section 3.4.2.3.4.5 refers back to the evaluation in this section)

- carbon steel closure bolting in the auxiliary steam system that is exposed to an air – outdoor (exterior) environment (SER Section 3.4.2.3.5.3 refers back to the evaluation in this section)

3.4.2.3.1.7 AMRs for Management of Loss of Material in Aluminum Main Steam System Components Under Exposure to a Air - Outdoor (Interior) Environment

LRA Table 3.4.2-1, "Main Steam System – Summary of Aging Management Review," includes a plant-specific AMR item for its aluminum alloy filler/breather caps in the ARV local (manual) actuator oil reservoirs. In this plant-specific AMR item, the applicant identified that loss of material is an aging effect requiring management (AERM) for the interior component surfaces that are exposed to the air – outdoor (interior) environment and credited its One-Time Inspection Program to manage loss of material in these component surfaces.

The staff asked the applicant to justify why a one-time inspection is considered to be adequate to manage loss of material in the component surfaces that are exposed to the air – outdoor (interior) environment in lieu credited periodic inspections of the component surfaces. The applicant provided the following response to the staff's question:

> According to the EPRI Mechanical Tools (TR-1010639), an aggressive environment consisting of a wetted surface or pooled liquid, oxygen, and contaminants must be present for corrosion to occur in aluminum. The ARV local actuator oil reservoir filler/breather cap interior surfaces are subjected to an air - outdoor (interior) environment in which the potential for atmospheric moisture exists. However, atmospheric moisture does not provide a significant source of contaminants. And, due to the sheltered nature of the interior surfaces, there would not be a continuous supply of contaminants. Furthermore, aluminum resists corrosion due to the presence of a thin aluminum oxide film covering the surface. There is also no operating experience at VEGP which presents a case for significant loss of material for aluminum in an air - outdoor (interior) environment. Therefore, SNC plans to use the One-Time Inspection Program to verify no loss of material in the aluminum ARV local actuator oil reservoir filler/breather cap surfaces that are exposed to an air - outdoor (interior) environment.

According to Volume 13B of the ASM Metals Handbook (2003 Edition), aluminum materials have excellent corrosion resistance under exposure to normal air (atmospheric) environments due to the presence of an aluminum oxide layer that passivates and protects the underlying aluminum material from further corrosion in environments in a pH range of 4 – 8.5. The staff assumes that the pH of the air environment is normally neutral and therefore, that the pH of the applicant's air – outdoor (interior) environment is within the pH range of 4 – 8.5. Based on this assumption, the staff concludes that the passivating aluminum oxide layer for these aluminum filler/breather cap components will be stable under exposure to the air – outdoor (interior) environment and will be capable of protecting the components from further oxidation of the aluminum used to fabricate the components. According to GALL AMP XI.M32, an applicant may credit its One-Time Inspection Program for aging management to verify the effectiveness of an AMP and confirm the insignificance of an aging effect. Thus, the staff concludes that the One-Time Inspection Program is an applicable program to verify the validity of this assumption or to verify that a breakdown of the protective aluminum oxide layer has not occurred (such as might occur in the pH of the environment were to fall outside of the 4 – 8.5 pH range and pitting were to occur through the aluminum oxide layer).

Based on this review, the staff concludes that the One-Time Inspection Program is a valid program to credited because: (1) the exterior surfaces of the aluminum filler/breather caps have an aluminum oxide layer that protects the components from additional corrosion (i.e., further oxidation of the aluminum material used to fabricate the components), (2) the staff does not anticipate any breakdown of the protective aluminum oxide layer or any additional corrosion (oxidation) other than that which formed the original aluminum oxide layer for the aluminum filler/breather cap materials, (3) the One-Time Inspection Program is a valid program to credit for those components where aging is not anticipated, (4) the One-Time Inspection Program will be used to verify whether or not additional corrosion of these aluminum materials is occurring or whether or not breakdown (pitting) of the protective aluminum oxide layer is occurring, and thus, whether the assumptions on the pH of the air – outdoor (exterior) environment and the stability of the protective aluminum oxide layer remains valid, and (5) the applicant’s crediting of the One-Time Inspection Program is consistent with the objective for crediting one-time inspection programs for aging management, as stated in GALL AMP XI.M32, “One-Time Inspection.”

Based on this assessment, the staff concludes that the applicant’s plant-specific AMR item on loss of material of these aluminum filler/breather caps is acceptable. The staff has evaluated the ability of the One-Time Inspection Program to manage loss of material in these aluminum components and its evaluation is described in SER Section 3.0.3.1.2. The staff’s question is resolved.

3.4.2.3.1.8 Main Steam System – Overall Conclusions for Aging Management Review of Plant-Specific AMR Results in LRA Table 3.4.2-1

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 for the main steam system components 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).

3.4.2.3.2 Feedwater System - Summary of Aging Management Review – LRA Table 3.4.2-2

The staff reviewed LRA Table 3.4.2-2, which summarizes the results of AMR evaluations for the feedwater system component groups. The staff’s evaluation of the plant-specific AMR results (i.e., AMR results that are not consistent with the GALL Report or not addressed in the GALL Report) for the feedwater system are described in the subsections that follow:

3.4.2.3.2.1 AMRs for Stainless Steel Feedwater System Components Under Exposure to an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-2, "Feedwater System – Summary of Aging Management Review," includes plant-specific AMR items for the following stainless steel feedwater system components that are exposed to an air – outdoor (exterior) environment:

- flow orifices/elements
- piping components
- valve bodies

In these plant-specific AMR items, the applicant did not identify any aging effects requiring management (AERMs) for the exterior component surfaces that are exposed to the air – outdoor (exterior) environment, and therefore did not credit any AMPs for aging management of these component surfaces.

The staff's basis for accepting that there are not any AERMs for the stainless steel component surfaces that are exposed an air – outdoor (exterior) environment is described in SER Section 3.4.2.3.1.2.

3.4.2.3.2.2 AMRs for Carbon Steel Feedwater System Components Under Exposure to an Air - Outdoor (Exterior, T ≥ 100 ºC [T ≥ 212 ºF]) Environment

LRA Table 3.4.2-2, "Feedwater System – Summary of Aging Management Review," includes plant-specific AMR items for the following carbon steel feedwater system components that are exposed to an air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment:

- piping components (including forged sections for 5-way pipe restraints)
- valve bodies

In these plant-specific AMR items, the applicant did not identify any aging effects requiring management (AERMs) for the exterior component surfaces that are exposed to the air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment and therefore did not credit any AMPs for aging management of these component surfaces.

The staff's basis for accepting that there are not any AERMs for the stainless steel component surfaces that are exposed to an air – outdoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment is described in SER Section 3.4.2.3.1.5

3.4.2.3.2.3 AMRs for Management of Loss of Pre-load in Carbon Steel Feedwater System Closure Bolting Under Exposure to an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-2, "Feedwater System – Summary of Aging Management Review," includes the following plant-specific AMR item for closure bolting in the feedwater system:

- carbon steel closure bolting under exposure to an air – outdoor (exterior) environment

In these plant-specific AMR items, the applicant identified that loss of preload is an aging effect requiring management (AERM) for the bolting components. The applicant credited its Bolting Integrity Program to manage loss of preload in these bolting components.

The staff's basis for accepting the Bolting Integrity Program to manage loss of preload in carbon steel or stainless steel S&PC bolting components under exposure either an air – indoor (exterior) environment or an air – outdoor (exterior) is described in SER Section 3.4.2.3.1.6.

3.4.2.3.2.4 Feedwater System – Overall Conclusions for Aging Management Review of Plant-Specific AMR Results in LRA Table 3.4.2-2

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 for the feedwater system 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).

3.4.2.3.3 Steam Generator Blowdown Processing System - Summary of Aging Management Review – LRA Table 3.4.2-3

The staff reviewed LRA Table 3.4.2-3, which summarizes the results of AMR evaluations for the steam generator blowdown processing system component groups. The staff's evaluation of the plant-specific AMR results (i.e., AMR results that are not consistent with the GALL Report or not addressed in the GALL Report) for the steam generator blowdown processing system are described in the subsections that follow:

3.4.2.3.3.1 AMRs for Carbon Steel Steam Generator Blowdown Processing System Components Under Exposure to an Air - Indoor (Exterior, T ≥ 212 ºF) Environment

LRA Table 3.4.2-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," includes plant-specific AMR items for the following carbon steel steam generator blowdown processing system components that are exposed to an air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment:

- piping components
- valve bodies

In these plant-specific AMR items, the applicant did not identify any aging effects requiring management (AERMs) for the exterior component surfaces that are exposed to the air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment and therefore did not credit any AMPs for aging management of these component surfaces.

The staff's basis for accepting that there are not any AERMs for the carbon steel component surfaces that are exposed to an air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment is described in SER Section 3.4.2.3.1.5

3.4.2.3.3.2 AMRs for Management of Loss of Material in Stainless Steel Steam Generator Blowdown Processing System Components Under Exposure to a Treated Water (Interior, Aggressive Chemistry) Environment

LRA Table 3.4.2-3, “Steam Generator Blowdown Processing System – Summary of Aging Management Review,” includes plant-specific AMR items for the following stainless steel components that are exposed to a treated water (interior, aggressive chemistry) environment:

- flow orifices/elements
- steam traps
- piping components
- valve bodies

In these AMRs, the applicant identified that loss of material is an aging effect requiring management (AERM) for the interior component surfaces that are exposed to the treated water (interior, aggressive chemistry) environment and credited the One-Time Inspection Program to manage this aging effect. The staff asked the applicant to justify why a One-Time Inspection Program is valid to manage this loss of material in these components, particularly when the specific treated water environment had been identified as an aggressive corrosive environment.

In its response, the applicant stated that, as a result of operating experience with corrosion of carbon steel components that are downstream of the steam generator blowdown processing system demineralizers, the treated water (interior, aggressive chemistry) environment is considered to be aggressive with the environments potential to induced corrosion in carbon steel components, not stainless steel components. The applicant stated that, while the stainless steel components that are exposed to this environment are expected to be resistant to corrosion, loss of material due to corrosion is conservatively treated as an applicable aging effect for the stainless steel. As a result, the applicant stated that loss of material due to corrosion is not expected to initiate in the stainless steel component surfaces that are exposed to the treated water (interior, aggressive chemistry) environment. The applicant stated that the One-Time Inspection Program will be used to verify that loss of material from corrosion is not initiating in the stainless steel components surfaces that are exposed to this environment.

For these plant-specific AMR items, it is the internal surfaces of the stainless steel components that are exposed to the treated water (interior, aggressive chemistry). Thus, while loss of material due to corrosive mechanisms is unlikely, the applicant has assumed that it does have a small probability of occurring and that it is appropriate for the One-Time Inspection Program to be credited to confirm either the loss of material due to corrosion is not occurring, or to propose corrective actions if the presence of corrosion is verified in the inside component surfaces. In the GALL Report, the staff included GALL AMP XI.M32, “One-Time Inspection Program,” for cases where an inspection-based AMP is necessary to verify the effectiveness of a mitigative-based AMP (e.g., to verify the effectiveness of a Water Chemistry Program or a Lubricating Oil Analysis Program) or else to provide additional assurance that aging that has not yet manifested itself, is not occurring, or that the evidence of aging shows that the aging is so insignificant that an aging management program is not warranted.

Thus, consistent with the GALL Report, the staff finds that the applicant is warranted in crediting the One-Time Inspection Program to manage loss of material in these stainless steel components because the AMP will be used to confirm that corrosion has not occurred in the internal surfaces that are exposed to the air – outdoor (interior, wetted) environment. Based on this review, the staff concludes the applicant's basis is acceptable because: (1) the applicant has conservatively assumed that loss of material due to corrosion, while not expected, could possibly occur in the stainless steel component surfaces that are exposed to a treated water (interior, aggressive chemistry) environment, (2) the applicant has credited its One-Time Inspection Program to manage loss of material in the stainless steel internal surfaces that are exposed to the treated water (interior, aggressive chemistry) environment, and (3) the applicant's crediting of the One-Time Inspection Program is consistent with the objective for crediting one-time inspection programs for aging management, as stated in GALL AMP XI.M32, "One-Time Inspection." The staff has evaluated the ability of the One-Time Inspection Program to manage loss of material in components that are exposed to this environment, and its evaluation is described in SER Section 3.0.3.1.2. The staff's question is resolved.

3.4.2.3.3.3 AMRs for Management of Loss of Material in Carbon Steel Steam Generator Blowdown Processing System Components Under Exposure to a Treated Water (Interior, Aggressive Chemistry) Environment

LRA Table 3.4.2-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," includes plant-specific AMR items for the following carbon steel components that are exposed to a treated water (interior, aggressive chemistry) environment:

- piping components
- valve bodies

In these AMRs, the applicant identified that loss of material is an AERM for the interior component surfaces that are exposed to the treated water (interior, aggressive chemistry) environment and credited the Flow-Accelerated Corrosion Program to manage this aging effect. The staff asked the applicant to identify the corrosion mechanisms that could induce loss of material in these carbon steel components and to justify why the Flow-Accelerated Corrosion Program (LRA AMP B.3.10) is considered to be a valid program for managing loss of material in these components.

In its response, the applicant provided the following response to the staff's question.

> The affected piping has not been subjected to metallurgical analysis, so the specific aging mechanism(s) which are active in this material and environment combination have not been confirmed. However, the loss of material is easily identifiable via ultrasonic testing, and is therefore considered to be a form of general corrosion, as opposed to localized corrosion such as pitting.
>
> These components will be scheduled for ultrasonic testing (UT) inspection by the Flow-Accelerated Corrosion Program. Corrosion of these components is not modeled by CHECWORKS™, therefore scheduling will be performed in accordance with the guidance in the Flow-Accelerated Corrosion Program for "susceptible but not modeled" lines.

The applicant's response clarifies that, while the mechanisms leading to loss of material in these carbon steel components have not yet been established, the aging effect is readily detectable by UT, and that, therefore, the Flow-Accelerated Corrosion Program is a valid program to credit for the detection of loss of material in these components.

UT examination techniques are volumetric non-destructive testing techniques that have the ability to detect relevant flaw indications that are either surface penetrating or subsurface in nature. The staff has evaluated the Flow-Accelerated Corrosion Program in SER Section 3.0.3.2.7. In SER Section 3.0.3.2.7, the staff provides its basis for concluding that the applicant's Flow-Accelerated Corrosion Program is an acceptable AMP for managing loss of material in the steel piping, piping components, and piping elements (including carbon steel and alloy steel components) for which it is credited. In SER Section 3.0.3.2.7, the staff also provides its basis why the UT inspections of the Flow-Accelerated Corrosion Program are acceptable for detecting loss of material in these steel components, as initiated by either flow-accelerated corrosion, or by other mechanisms (e.g., cavitation, general corrosion, etc.) that can induce loss of material. The applicant has indicated that the scheduling of these components for UT inspection will be done in accordance with the Flow-Accelerated Corrosion Program's scheduling criteria for susceptible steel piping lines that are not modeled by the applicant's CHECWORKS modeling. The staff's basis for accepting the Flow-Accelerated Corrosion Program's scheduling criteria for non-modeled steel piping lines is described in SER Section 3.0.3.2.7. Therefore, based on this assessment, the staff concludes that the Flow-Accelerated Corrosion Program is a valid program to credit for management of loss of material in these steel components because: (1) the Flow-Accelerated Corrosion Program will implement UT examination techniques to detect loss of material in the components, (2) the UT examination methods credited by the applicant are volumetric techniques that are capable of detecting loss of material in these steel piping, piping components, and piping elements (i.e., the valve bodies are piping elements), (3) the staff has determined, in SER Section 3.0.3.2.7, that the applicant's Flow-Accelerated Corrosion Program is an acceptable AMP for managing loss of material in steel piping, piping components, and piping elements. The staff's question is resolved.

3.4.2.3.3.4 AMRs for Management of Loss of Pre-load in Carbon Steel Steam Generator Blowdown Processing System Closure Bolting Under Exposure to an Air - Indoor (Exterior) Environment

LRA Table 3.4.2-3, "Steam Generator Blowdown Processing System – Summary of Aging Management Review," includes the following plant-specific AMR item for closure bolting in the steam generator blowdown processing system:

- carbon steel closure bolting under exposure to an air – indoor (exterior) environment

In these plant-specific AMR items, the applicant identified that loss of preload is an aging effect requiring management (AERM) for the bolting components. The applicant credited its Bolting Integrity Program to manage loss of preload in these bolting components.

The staff's basis for accepting the Bolting Integrity Program to manage loss of preload in carbon steel or stainless steel S&PC bolting components under exposure either an air – indoor (exterior) environment or an air – outdoor (exterior) is described in SER Section 3.4.2.3.1.6.

3.4.2.3.3.5 Steam Generator Blowdown Processing System – Overall Conclusions for Aging Management Review of Plant-Specific AMR Results in LRA Table 3.4.2-3

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 for the steam generator blowdown processing system 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).

3.4.2.3.4 Auxiliary Feedwater System - Summary of Aging Management Review – LRA Table 3.4.2-4

The staff reviewed LRA Table 3.4.2-4, which summarizes the results of AMR evaluations for the auxiliary feedwater system component groups. The staff's evaluation of the plant-specific AMR results (i.e., AMR results that are not consistent with the GALL Report or not addressed in the GALL Report) for the auxiliary feedwater system are described in the subsections that follow:

3.4.2.3.4.1 AMRs for Management of Loss of Material in Aluminum Alloy Auxiliary Feedwater System Components Under Exposure to a Lubricating Oil Environment

LRA Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," includes plant-specific AMR items for the following aluminum components in the auxiliary feedwater system that are exposed to a lubricating oil environment:

- aluminum filter housings

In these AMR items, the applicant identifies that loss of material is an applicable AERM for the surfaces that are exposed to the hydraulic fluid environment. In these AMRs, the applicant credits the Oil Analysis Program (LRA AMP B.3.16) to manage loss of material in the component surfaces that are exposed to hydraulic fluid environment.

The applicant also credited its One-Time Inspection Program to verify that loss of material has not occurred in the component surfaces that are exposed to hydraulic fluid and to verify that the applicant's Oil Analysis Program is accomplishing its mitigative management function.

The staff's basis for accepting the AMPs that are credited to manage loss of material due to pitting or crevice corrosion in aluminum S&PC components under exposure either a lubricating oil or hydraulic fluid environment is described in SER Section 3.4.2.3.1.1.

3.4.2.3.4.2 AMRs for Management of Loss of Material in Stainless Steel Auxiliary Feedwater System Components Under Exposure to Either a Drainage - Dirty (Interior) Environment or a Drainage - Dirty (Exterior) Environment

LRA Table 3.4.2-4, “Auxiliary Feedwater System – Summary of Aging Management Review,” includes plant-specific AMR items for the following stainless steel auxiliary feedwater system components that are exposed to either a drainage – dirty (interior) environment or a drainage – dirty (exterior) environment:

- piping components – interior surfaces exposed to a drainage – dirty (interior) environment
- piping components – exterior surfaces exposed to a drainage – dirty (exterior) environment
- turbine driven auxiliary feedwater pump (TDAFWP) steam exhaust condensate spargers – interior surfaces exposed to a drainage – dirty (interior) environment
- turbine driven auxiliary feedwater pump (TDAFWP) steam exhaust condensate spargers – exterior surfaces exposed to a drainage – dirty (exterior) environment

In these AMR items, the applicant identifies that loss of material is an applicable aging effect requiring management (AERM) for the surfaces that are exposed to either a drainage – dirty (interior) environment or a drainage – dirty (exterior) environment. In these AMRs, the applicant credits the Piping and Duct Internal Inspection Program (LRA AMP B.3.22) to manage loss of material in the component surfaces that are exposed to either the drainage – dirty (interior) environment or the drainage – dirty (exterior) environment.

The staff asked the applicant to provide its basis for crediting this AMP for aging management, particularly if the dirty environment were to create an aggressive corrosive environment for the stainless steel piping components. In its response, the applicant stated that the components addressed in these AMR items are miscellaneous stainless steel piping and components that are located in the auxiliary feedwater pump houses. The applicant also stated that, for these AMRs, the drainage – dirty environment is defined as an environment used to describe dirty leakage or leak-off from equipment containing unmonitored liquids and that the sources of drainage into the pump sump areas may be from either, treated non-borated water, treated borated water, raw water, or oils. The applicant also stated that the drainage is assumed to contain contaminants that could lead to corrosion, and that, since the presence of contaminants is assumed, the same mechanisms leading to loss of material of stainless steel in raw water are assumed for these – that is general corrosion, pitting corrosion, and microbiologically-induced corrosion (MIC).

The applicant also stated that, since the majority of the potential sources of leakage or drainage are from systems where the chemistry is controlled, and because none of the known potential sources are aggressive with respect to stainless steels, a program of periodic inspections such as the Piping and Duct Internal Inspection Program is adequate to manage loss of material in the components during the period of extended operation.

The staff's program element criteria for piping and duct inspection programs are described in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The staff included this program in the GALL Report to cover inspection criteria for the internal surfaces of steel piping, piping components, ducting, and other components that are not covered by other aging management programs. The GALL Report states that the internal inspections within the scope of GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," are to performed during the periodic system and component surveillances or during the performance of maintenance activities when the surfaces are made accessible for visual inspection.

The applicant's Piping and Duct Internal Inspection Program (LRA AMP B.3.22) is the applicant's program that corresponds to GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The staff has evaluated the applicant's Piping and Duct Internal Inspection Program and its evaluation is described in SER Section 3.0.3.2.13. In SER Section 3.0.3.2.13, the staff provides its basis for concluding that the applicant's Piping and Duct Internal Inspection Program is an acceptable program to credit for managing loss of material in the internal surfaces of miscellaneous stainless steel piping and ducting components. Based on this analysis, the staff concludes that the applicant's Piping and Duct Internal Inspection Program is a valid program to credit for the management of loss of material in the internal surfaces of these stainless steel piping and components because the crediting of the program is consistent with the program description objective statement in GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." The staff's question is resolved.

3.4.2.3.4.3 AMRs for Stainless Steel Auxiliary Feedwater System Components Under Exposure to Either an Air - Outdoor (Interior) Environment or an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," includes plant-specific AMR items for the following stainless steel auxiliary feedwater system components that are exposed to either an air – outdoor (interior) environment or an air – outdoor (exterior) environment:

- piping components – exterior stainless steel surfaces exposed to the air – outdoor (exterior) environment

- piping components – interior stainless steel surfaces exposed to the air – outdoor (interior) environment

- flow orifices / elements – interior stainless steel surfaces exposed to the air – outdoor (interior) environment

- condensate storage tank (CST) vacuum degasifier pumps – exterior stainless steel pump casing surfaces exposed to the air – outdoor (exterior) environment

- valve bodies – exterior stainless steel surfaces exposed to the air outdoor (exterior) environment

- CST tank liners (and internals) – interior stainless steel liner surfaces exposed to the air - outdoor (interior) environment.

In these plant-specific AMR items, the applicant did not identify any aging effects requiring management (AERMs) for stainless steel component surfaces that are exposed to either the air – outdoor (interior) environment or the air – outdoor (exterior) environment, and therefore did not credit any AMPs for aging management of these component surfaces.

The staff's basis for accepting that there are not any AERMs for the exterior stainless steel component surfaces that are exposed to either an air – outdoor (interior) environment or an air – outdoor (exterior) environment is described in SER Section 3.4.2.3.1.2

3.4.2.3.4.4 AMRs for Aging Management of Elastomeric Auxiliary Feedwater System Components Under Exposure to Either a Treated Water (Interior) Environment or an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," includes plant-specific AMR items for the following elastomeric auxiliary feedwater system components that are exposed to either a treated water (interior) environment or an air – outdoor (exterior) environment:

- tank diaphragms in the condensate storage tank (CST) – interior surfaces exposed to a treated water (interior) environment

- tank diaphragms in the CST – exterior surfaces exposed to an air – outdoor (exterior) environment

For these AMR items, the applicant identified that changes in material properties is an aging effect requiring management (AERM) for the period of extended operation, and credited its Periodic Surveillance and Preventative Maintenance Activities to manage this aging effect.

The staff asked the applicant to identify material properties for the elastomeric materials that are impacted by these environments and to clarify how the program elements for this AMP are capable of managing changes in the material properties for these elastomers. In its response, the applicant stated that the material properties that may be impacted by exposure of the elastomeric diaphragms to a treated water (interior) or an air - outdoor (exterior) environment include a high degree of flexibility, good resiliency (low modulus of elasticity), and chemical and abrasion resistance, and that aging of these components may lead to progressive hardening, loss of resiliency, cracking or loss of material. The applicant stated that the inspections of the elastomeric materials under the Periodic Surveillance and Preventive Maintenance Activities will be performed in accordance with this industry guidance and manufacturer recommendations, and that the inspection methods include flexing of the material to identify cracking or crazing visual examinations of the components to detect for evidence of waxy or chalky residues, peeling, blistering, delamination, flaking, discoloration, physical distortion, embrittlement (hardening), or gross softening.

The applicant's Periodic Surveillance and Preventative Maintenance Activities are defined in LRA AMP B.3.21. The applicant's Periodic Surveillance and Preventative Maintenance

Activities do not have any corresponding activities or AMPs in the GALL Report, Revision 1, Volume 2. Thus, the applicant's program has been identified as a plant-specific program for the VEGP LRA, and the applicant has defined this program in terms of the 10 program elements for the AMP compared with the recommended program element criteria established by the staff in Appendix A of the NUREG-1800, Revision 1 (i.e, in Branch Position RLSB-01 of the SRP-LR). The staff noted that the applicant has also stated that it will implement the recommendations of EPRI Report, EPRI Report 1007933, "Aging Assessment Field Guide," to perform the visual and tactile inspections of elastomeric materials that are used to fabricate these diaphragms. The staff also verified that the CST tank diaphragms are within the scope of this AMP, and that the "detection of aging effects" program element for the Periodic Surveillance and Preventative Maintenance Activities includes criteria for visually inspecting the tank diaphragms for the aging effects identified by the applicant in its response to the staff's question. Based on this assessment, the staff concludes that it is acceptable to use the Periodic Surveillance and Preventative Maintenance Activities to manage changes in material properties of these elastomeric diaphragms because the applicant will perform visual examinations to monitor for signs of aging that may be indicative of a change in the material properties of the elastomeric materials, and because the applicant will use recommended industry guidelines for performing these examinations. The staff has evaluated the ability of the Periodic Surveillance and Preventative Maintenance Activities to manage aging in the elastomeric CST tanks diaphragms and the staff's evaluation is described in SER Section 3.0.3.3.6. The staff's question is resolved.

3.4.2.3.4.5 AMRs for Aging Management of Loss of Preload in Stainless Steel or Carbon Steel Auxiliary Feedwater System Closure Bolting Under Exposure to an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-4, "Auxiliary Feedwater System – Summary of Aging Management Review," includes the following plant-specific AMR item for closure bolting in the auxiliary feedwater system:

- carbon steel closure bolting under exposure to an air – outdoor (exterior) environment

In these plant-specific AMR items, the applicant identified that loss of preload is an aging effect requiring management (AERM) for the bolting components. The applicant credited its Bolting Integrity Program to manage loss of preload in these bolting components.

The staff's basis for accepting the Bolting Integrity Program to manage loss of preload in carbon steel or stainless steel S&PC bolting components under exposure either an air – indoor (exterior) environment or an air – outdoor (exterior) is described in SER Section 3.4.2.3.1.6.

3.4.2.3.4.6 Auxiliary Feedwater System – Overall Conclusions for Aging Management Review of Plant-Specific AMR Results in LRA Table 3.4.2-4

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 for the auxiliary feedwater system 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).

3.4.2.3.5 Auxiliary Steam System - Summary of Aging Management Review – LRA Table 3.4.2-5

The staff reviewed LRA Table 3.4.2-5, which summarizes the results of AMR evaluations for the auxiliary steam system component groups. The staff's evaluation of the plant-specific AMR results (i.e., AMR results that are not consistent with the GALL Report or not addressed in the GALL Report) for the auxiliary feedwater system are described in the subsections that follow:

3.4.2.3.5.1 AMRs for Stainless Steel Auxiliary Steam System Components Under Exposure to an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-5, "Auxiliary Steam System – Summary of Aging Management Review," includes a plant-specific AMR item for the following stainless steel auxiliary steam system components that are exposed to an air – outdoor (exterior) environment:

- flow orifices / elements – exterior stainless steel surfaces exposed to the air – outdoor (exterior) environment

In this plant-specific AMR item, the applicant did not identify any aging effects requiring management (AERMs) for stainless steel component surfaces that are exposed to the air – outdoor (exterior) environment, and therefore did not credit any AMPs for aging management of these component surfaces.

The staff's basis for accepting that there are not any AERMs for the exterior stainless steel component surfaces that are exposed to the air – outdoor (exterior) environment is described in SER Section 3.4.2.3.1.2

3.4.2.3.5.2 AMRs for Carbon Steel Auxiliary Steam System Components Under Exposure to an Air - Indoor (Exterior, T ≥ 212 ºF) Environment

LRA Table 3.4.2-5, "Auxiliary Steam System – Summary of Aging Management Review," includes plant-specific AMR items for the following carbon steel auxiliary steam system components that are exposed to an air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment:

- piping components
- steam/fluid trap bodies
- valve bodies

In these plant-specific AMR items, the applicant did not identify any aging effects requiring management (AERMs) for the exterior component surfaces that are exposed to the air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment and therefore did not credit any AMPs for aging management of these component surfaces.

The staff's basis for accepting that there are not any AERMs for the carbon steel component surfaces that are exposed to an air – indoor (exterior, T ≥ 100 ºC [T ≥ 212 ºF]) environment is given in SER Section 3.4.2.3.1.5

3.4.2.3.5.3 AMRs for Aging Management of Loss of Preload in Carbon Steel Auxiliary Steam System Closure Bolting Under Exposure to an Air - Outdoor (Exterior) Environment

LRA Table 3.4.2-5, "Auxiliary Steam System – Summary of Aging Management Review," includes the following plant-specific AMR item for closure bolting in the auxiliary steam system:

- carbon steel closure bolting under exposure to an air – outdoor (exterior) environment

In these plant-specific AMR items, the applicant identified that loss of preload is an aging effect requiring management (AERM) for the bolting components. The applicant credited its Bolting Integrity Program to manage loss of preload in these bolting components.

The staff's basis for accepting the Bolting Integrity Program to manage loss of preload in carbon steel or stainless steel S&PC bolting components under exposure either an air – indoor (exterior) environment or an air – outdoor (exterior) is given in SER Section 3.4.2.3.1.6.

3.4.2.3.5.4 Auxiliary Steam System – Overall Conclusions for Aging Management Review of Plant-Specific AMR Results in LRA Table 3.4.2-5

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 for the auxiliary steam system 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 Containments, Structures, and Component Supports

This section of the SER documents the staff's review of the applicant's AMR results for the containments, structures, and component supports components and component groups of:

- containment structures
- auxiliary, control, fuel handling and equipment buildings

- emergency diesel generator structures
- turbine building
- tunnels and duct banks
- NSCW structures
- concrete tank and valve house structures
- switch yard structures
- fire protection structures
- radwaste structures
- auxiliary feedwater pump house structures
- component supports and bulk commodities

3.5.1 Summary of Technical Information in the Application

LRA Section 3.5 provides AMR results for the containments, structures, and component supports components and component groups. LRA Table 3.5.1, “Summary of Aging Management Evaluations for Structures and Component Supports in Chapters II and III of NUREG-1801,” is a summary comparison of the applicant’s AMRs with those evaluated in the GALL Report for the containments, structures, and component 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 containments, structures, and component 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 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 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 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.

Table 3.5-1 summarizes the staff's evaluation of components, aging effects or mechanisms, and AMPs listed in LRA Section 3.5 and addressed in the GALL Report.

Table 3.5-1 Staff Evaluation for Containments, Structures, and Component Supports in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
PWR Concrete (Reinforced and Prestressed) and Steel 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.	Yes	Inservice Inspection Program - IWL (B.3.31)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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 licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
Concrete elements: foundation, sub-foundation (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 licensee is to ensure proper functioning of the de-	Yes	Not Applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
		watering system through the period of extended operation.			
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 aging management program is to be evaluated.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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 Part 50, Appendix J	Yes	Not applicable	Not applicable to PWRs
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 Part 50, Appendix J	Yes	Inservice Inspection Program - IWE (B.3.30) 10 CFR 50 Appendix J Program (B.3.29)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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)	Yes	TLAA -Concrete Containment Tendon Prestress Analysis (Section 4.5)	Consistent with GALL Report which recommends further evaluation (See Section 3.5.2.2.1)
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)	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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)	Yes	TLAA - Penetration Load Cycles (Section 4.6)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds (3.5.1-10)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
Stainless steel vent line bellows, (3.5.1-11)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds.	Yes	Not applicable	Not applicable to PWRs
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 Part 50, Appendix J, and supplemented to detect fine cracks	Yes	Not applicable	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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 Part 50, Appendix J, and supplemented to detect fine cracks	Yes	Not applicable	Not applicable to PWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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).	Yes	Not Applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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.	Yes	Inservice Inspection Program - IWL (B.3.31)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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 Part 50, Appendix J	No	Inservice Inspection - IWE and 10 CFR Part 50, Appendix J	Consistent with GALL Report (See SER Section 3.5.2.2.1)
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 Part 50, Appendix J and plant Technical Specifications	No	10 CFR Part 50, Appendix J and Plant Technical Specifications	Consistent with GALL Report (See SER Section 3.5.2.2.1)
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 Part 50, Appendix J	No	Inservice Inspection - IWE and 10 CFR Part 50, Appendix J	Consistent with GALL Report (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Steel elements: stainless steel suppression chamber shell (inner surface) (3.5.1-19)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable	Not applicable to PWRs
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 Part 50, Appendix J	No	Not applicable	Not applicable to PWRs
Steel elements: drywell head and downcomer pipes (3.5.1-21)	Fretting or lock up due to mechanical wear	ISI (IWE)	No	Not applicable	Not applicable to PWRs
Prestressed containment: tendons and anchorage components (3.5.1-22)	Loss of material due to corrosion	ISI (IWL)	No	Inservice Inspection - IWL	Consistent with GALL Report (See SER Section 3.5.2.2.1)
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	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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.	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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).	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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.	Yes	Not applicable	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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 licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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.	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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.	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
Groups 1-5: concrete (3.5.1-33)	Reduction of strength and modulus due to elevated temperature	A plant-specific aging management program is to be evaluated	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	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.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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).	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
Group 6: all accessible and 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.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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.	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
Groups 7, 8: tank liners (3.5.1-38)	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated	Yes	One-Time Inspection Program (B.3.17) Water Chemistry Control Program (B.3.28)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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	Yes	Structures Monitoring Program (B.3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
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	Yes	Structures Monitoring Program (B3.32)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.5.2.2.1)
Vibration isolation elements (3.5.1-41)	Reduction or loss of isolation function, radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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)	Yes	Not applicable	Not applicable to VEGP (See SER Section 3.5.2.2.1)
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	No	Structural Monitoring Program - Masonry Wall (B.3.33)	Consistent with GALL Report (See SER Section 3.5.2.2.1)
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	No	Not applicable	Not applicable to VEGP
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 or FERC/US Army Corps of Engineers dam inspections and maintenance	No	Not applicable	Not applicable to VEGP
Group 5: fuel pool liners (3.5.1-46)	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No	Water Chemistry Control Program (B.3.28) and monitoring of spent fuel pool water level in accordance with technical specifications	Consistent with 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.	No	Not applicable	Not applicable to VEGP

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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 or FERC/US Army Corps of Engineers dam inspections and maintenance programs	No	Not applicable	Not applicable to VEGP
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-49)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	No	Not applicable	Not applicable to PWRs
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	No	Structures Monitoring Program (B.3.32)	Consistent with GALL Report (See SER Section 3.5.2.1)
Group B1.1: high strength low-alloy bolts (3.5.1-51)	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	No	Inservice Inspection – IWF (B.3.13)	Consistent with GALL Report (See SER Section 3.5.2.1)
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	No	IWF and Structures Monitoring Program	Consistent with GALL Report (See SER Section 3.5.2.1)
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)	No	ISI (IWF) and Structures Monitoring Program	Consistent with GALL Report (See SER Section 3.5.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Groups B1.1, B1.2, and B1.3: co`nstant 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)	No	ISI (IWF) and Structures Monitoring Program	Consistent with GALL Report (See SER Section 3.5.2.1)
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	No	Boric Acid Corrosion Program	Consistent with GALL Report (See SER Section 3.5.2.1)
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)	No	None	Consistent with GALL Report (See SER Section 3.5.2.1)
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)	No	Not applicable	Not applicable to VEGP
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	No	None	Consistent with GALL Report (See SER Section 3.5.2.1)
Stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-59)	None	None	No	None	Consistent with GALL Report (See SER Section 3.5.2.1)

The staff's review of the containments, structures, and component 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 containments, structures, and component support components is documented in SER Section 3.0.3.

3.5.2.1 AMR Results Consistent with the GALL Report

LRA Section 3.5.2.1 identifies the materials, environments, AERMs, and the following programs that manage aging effects for the containments, structures, and component support components:

- Boric Acid Corrosion Control Program
- Fire Protection Program
- Inservice Inspection Program - IWF
- Periodic Surveillance and Preventive Maintenance Activities
- Water Chemistry Control Program
- 10 CFR Part 50 Appendix J Program
- Inservice Inspection Program - IWE
- Inservice Inspection Program - IWL
- Structural Monitoring Program
- Structural Monitoring Program - Masonry Walls

LRA Tables 3.5.2-1 through 3.5.2-12 summarize AMRs for the containments, structures, and component supports 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 Report 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 Report AMP. The staff audited these line items to verify consistency with the GALL

Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 Report 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 determined 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 Report 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 Report AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL Report 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 determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA, as documented in SER Section 3.5.2.1. 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 is discussed below.

3.5.2.1.1 AMR Results Identified as Not Applicable:

In LRA Table 3.5.1, Items 44, 45, 47, 48, and 57 are identified as "Not Applicable," since the component/material/environment combination does not exist at VEGP. For each of these line items, the staff reviewed the LRA and the applicant's supporting documents, and confirmed the applicant's claim that the component, material, and environment combination does not exist at VEGP. On the basis that VEGP does not have the component; material; and environment combination for these Table 1 line items, the staff finds that these AMRs are not applicable to VEGP.

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 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 their 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

In LRA Section 3.5.2.2, the applicant further evaluated aging management, as recommended by the GALL Report, for the containments, structures, and component supports components and provided information concerning how it will manage aging effects in the following three areas:

(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 SCC
- 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 component 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 SCC 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) QA 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 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 the criteria in SRP-LR Section 3.5.2.2.1, 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.

LRA Section 3.5.2.2.1.1 addresses potential aging of inaccessible concrete areas in concrete and steel containments due to aggressive chemical attack and corrosion of embedded steel. NUREG-1801 indicates that further evaluation is necessary if the environment is aggressive. The applicant stated that, "VEGP containment inaccessible and accessible concrete areas are designed in accordance with American Concrete Institute (ACI) Specification 318-71. The resulting reinforced concrete is dense, with low permeability."

> Degradation due to aggressive chemical attack is not applicable to VEGP. Aggressive chemical attack only becomes significant when environmental conditions exceed threshold values (Chlorides > 500 ppm, Sulfates >1500 ppm, and pH < 5.5). VEGP is not located in areas exposed to sulfate or chloride attack, nor is it located near industrial plants whose emissions could alter environmental parameters. Groundwater analyses confirm that the VEGP site groundwater is not aggressive. Historical results are presented in VEGP UFSAR Table 2.4-12-3. Testing performed in November 2005 and May 2007 found pH values between 5.77 and 8.24, chloride values between 1.95 and 8.71 ppm, and sulfate values between 2.9 ppm and 12.5 ppm. Resistance to mild acid attack is enhanced through the use of dense concrete that has low permeability and a low water to cement ratio. The VEGP concrete structure uses a dense, low permeable concrete with a maximum water- to-cement ratio of 0.45, which provides an acceptable degree of protection against aggressive chemical attack.

Corrosion of embedded steel becomes significant environmental conditions are found to be aggressive. As noted above, VEGP groundwater analyses confirm that the VEGP site groundwater is not aggressive. Additionally, corrosion is not significant if the concrete has a low water to cement ratio, low permeability, and designed in accordance with ACI Standards (ACI 318 or ACI 349). The design and construction of the VEGP concrete structures generally prevents corrosion of embedded steel from occurring. However, minor corrosion of embedded steel has been observed in few locations at different VEGP concrete structures. As a result, corrosion of embedded steel is managed by the Inservice Inspection Program - IWL and Structural Monitoring Program (SMP).

For Inaccessible Areas at VEGP, continued implementation of the Structural Monitoring Program is sufficient to address leaching of calcium hydroxide and corrosion of embedded steel since:

(1) VEGP concrete was constructed to design requirements in accordance with ACI recommendations which produced a dense concrete with low permeability. Further, VEGP used a concrete design mix with maximum water- cement ratio of 0.35 - 0.45 which is specified by ACI Standards to be chemically resistant and watertight.
(2) Containment concrete surfaces are not exposed to flowing water and groundwater data indicates that an aggressive environment is not present at VEGP.
(3) The Structural Monitoring Program for VEGP will be enhanced to include requirements to inspect the condition of below grade concrete when it is exposed during excavation.

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 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.

On the basis of its audit and review, the staff concludes that increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack are not applicable aging effects for below-grade inaccessible concrete areas of the containments because VEGP is neither located in areas exposed to sulfate or chloride attack, nor it is located near industrial plants whose emissions could alter environmental parameters. Groundwater analyses also confirm that the VEGP site groundwater is not aggressive. The VEGP concrete structure uses a dense, low permeable concrete with a maximum water-to-cement ratio of 0.45, which provides an acceptable degree of protection against aggressive chemical attack.

However, the staff noted that cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are aging effects for below-grade inaccessible concrete areas of the containments because minor corrosion of embedded steel plate has been observed in few locations at different VEGP concrete structures. Since embedded plates that are exposed to humid air and outdoor conditions may be susceptible to corrosion, the applicant proposed to manage these aging effects using the Inservice Inspection Program - IWL, which imposes the inservice inspection requirement of ASME Section XI, Subsection IWL, and the Structures Monitoring Program. The staff's evaluations of the Inservice Inspection Program – IWL and the Structures Monitoring Program are documented in SER Section 3.0.3.3.10 and Section 3.0.3.2.17, respectively.

Because the inaccessible areas of the containment are not in an aggressive environment, the staff finds that applicant's inspections in accordance with the Inservice Inspection Program - IWL and the Structures Monitoring Program, which includes requirements to monitor groundwater and inspect the condition of below grade concrete when it is exposed during excavation, to manage corrosion of embedded steel are adequate and no additional plant-specific program is required.

During the audit and review, the staff noted that the applicant's LRA Table 3.5.2-1 identifies plant-specific Inservice Inspection Program-IWL as the aging management program to manage the potential aging of concrete cracking and loss of material for LRA Table 3.5.1, Item 3.5.1-1. However, the discussion column in Table 3.5.1 refers to the plant-specific Inservice Inspection Program-IWE as the aging management program for managing the aging effect for Item 3.5.1-1. The staff asked the applicant to clarify the discrepancies between these Tables.

In its response, the applicant stated that the reference to the plant-specific Inservice Inspection Program-IWE in LRA Table 3.5.1, Item 3.5.1-1 was an inadvertent error which will be corrected in an LRA amendment.

The staff confirmed that, in its letter dated March 20, 2008, the applicant amended the LRA Table 3.5.1, Item 3.5.1-1, to correct the reference to the AMP as Inservice Inspection Program - IWL (Appendix B.3.31).

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 or mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that LRA Table 3.5.1, Item 3.5.1-1, refers to LRA Subsection 3.5.2.2.1.1 in the discussion column. In Subsection 3.5.2.2.1.1, the following statement is made: "As a result, corrosion of embedded steel is managed by the Inservice Inspection Program - IWL and Structural Monitoring Program." However, the staff also noted that the Structural Monitoring Program is not credited to the associated line items on LRA Table 3.5.2-1. The staff asked the applicant to explain why the Structural Monitoring Program is not credited to the related line items on Table 3.5.2-1 for the containment structures.

In its response, the applicant stated that Subsection 3.5.2.2.1.1 addresses the Structural Monitoring Program because (1) the Structures Monitoring Program is used to ensure that groundwater is monitored, and (2) the Structures Monitoring Program is used for examination of exposed portions of below grade concrete in the groundwater environment when uncovered during removal of backfill.

Therefore, ID 2 and ID 3 of Table 3.5.2-1 will be revised to incorporate the Structural Monitoring Program for “soil” environment and “Cracking and loss of material” aging effect.

On the basis of its review of the applicant’s response, the staff finds the response acceptable because the amendment will include the Structures Monitoring Program to insure groundwater monitoring and below grade concrete examination during excavation for the associated containment line items in LRA Table 3.5.2-1, which appropriately addresses the aging effect or mechanism, as recommended by the GALL Report.

During the audit and review, the staff noted that in LRA Table 3.5.2-1, ID 2, for soil environment, cracking and loss of material aging effect, GALL Item II.A1-7 is referenced. Also, in LRA Table 3.5.2-1, ID 3, for soil environment, cracking and loss of material aging effect, GALL Item II.A1-7 is referenced. The staff finds that GALL Item II.A1-7 is associated with an air-indoor uncontrolled or air-outdoor environment. The staff asked the applicant to explain why GALL Item II.A1-7 is referred to in LRA Table 3.5.2-1, ID 2 and ID 3 for a soil environment and the impact on aging effect/aging management.

In its response, the applicant stated that GALL Item II.A1-7 includes only air-indoor uncontrolled or air-outdoor as the referenced environment. However, portions of the containment wall, buttresses and basemat concrete, foundation and subfoundation, which are located below grade, and may also be exposed to the soil environment.

For completeness, the soil environment was conservatively included in the Aging Management Review and the aging effect of change in material properties (due to leaching) and cracking and loss of material (due to corrosion of embedded steel) were identified in the LRA Table Summary in ID 2 and ID 3.

On the basis of its review of the applicant’s response, the staff finds the response acceptable because the soil environment is conservatively included for review as recommended by the GALL Report, which provides additional assurance that the effects of aging will be adequately managed.

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 concludes 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.

LRA Section 3.5.2.2.1.2 addresses cracks due to increased stress levels from settlement that may occur in PWR containments. Additionally, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations may occur in PWR containments. For plants that rely on a dewatering system, NUREG-1801 recommends verification of the continued functionality of the dewatering system during the period of extended operation. For all plants, NUREG-1801 recommends no further evaluation if these issues are managed by the applicant's Structural Monitoring Program. VEGP does not rely on a dewatering system for control of settlement. Differential settlement and erosion of porous concrete sub-foundations is not applicable to VEGP. VEGP structures are typically founded on consolidated backfill that is not subject to significant settlement. The concrete foundations at VEGP are not constructed of porous concrete and are not subject to flowing water.

Nonetheless, the absence of these aging effects is confirmed by inspections performed by the Inservice Inspection Program - IWL and the Structural Monitoring Program. In addition, settlement monitoring of various site structures is performed at VEGP and credited in the Structural Monitoring Program.

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 dewatering system to lower the site ground water level. If the plant's CLB credits a dewatering 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.

On the basis of its audit and review, the staff concludes that differential settlement and erosion of porous concrete sub-foundation are not plausible aging effects because containment structure is founded on consolidated backfill that is not subject to significant settlement. In addition, porous concrete was not utilized in the construction of the concrete foundations at VEGP.

However, the applicant conservatively elected to use its Structures Monitoring Program to monitor the above-grade exposed containment concrete for the aging effect of cracking due to settlement. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and that are adequate to manage 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.

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 concludes 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 3.5.2.2.1.3 against the criteria in SRP-LR Section 3.5.2.2.1.3.

LRA Section 3.5.2.2.1.3 addresses reduction of strength and modulus of concrete due to elevated temperatures, stating that this aging effect is not applicable to VEGP. Containment concrete degradation due to elevated temperatures is not applicable, because there are no containment concrete structural components exceeding the specified temperature limits. The containment is maintained below a bulk average temperature of 120°F by the Containment Cooling System. The area between the primary shield wall and the reactor vessel is maintained at a temperature below 150 °F by the Primary Shield and Reactor Supports Cooling System. In the case of piping carrying hot fluid, the pipe is insulated and the flued head penetration is designed to prevent excessive concrete temperatures and to prevent excessive heat losses from the fluid. The penetration assemblies are designed to limit the local area temperature of the concrete at the penetrations below a maximum temperature of 200 °F.

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 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. Subsection CC-3400 of ASME Code Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period.

On the basis of its audit and review, the staff finds that the reduction of strength and modulus of concrete structures due to elevated temperature are not plausible aging effects because no portion of the concrete containment components exceeds specified temperature limits, which are 150 °F for general area and 200 °F for local area.

On the basis that there are no components from this group which exceed the specified temperature thresholds, the staff concludes that this aging effect is not applicable to the VEGP containment.

Loss of Material Due to General, Pitting and Crevice Corrosion. The staff reviewed LRA Section 3.5.2.2.1.4 against the criteria in SRP-LR Section 3.5.2.2.1.4.

LRA Section 3.5.2.2.1.4 addresses loss of material due to general, pitting and crevice corrosion for steel elements of accessible and inaccessible areas of containments, stating that ASME Section XI, Subsection IWE and 10 CFR Part 50 Appendix J Programs are recommended to manage this aging effect. NUREG-1801 recommends further evaluation of plant-specific programs to manage this aging effect for inaccessible areas if corrosion is significant. Corrosion for inaccessible areas (e.g., embedded containment liner) is not expected for VEGP because containment concrete in contact with the embedded containment liner at VEGP was designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well cured, and low permeability concrete. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. Nonetheless, the absence of concrete aging effects is confirmed by inspections performed by the Inservice Inspection Program – IWE and the Structural Monitoring Program. Additionally, the Boric Acid Corrosion Control Program will manage corrosion of surfaces exposed to borated water leakage.

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 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.

On the basis of its audit and review, the staff concludes that loss of material due to general pitting and crevice corrosion are the aging effects for steel elements of accessible and inaccessible areas of containments. The applicant proposed to manage these aging effects using the Inservice Inspection Program – IWE and 10 CFR Part 50, Appendix J Program. The staff's evaluations of the Inservice Inspection Program – IWE and 10 CFR Part 50, Appendix J are documented in SER Section 3.0.3.3.9 and Section 3.0.3.1.5, respectively.

Because VEGP containment concrete in contact with the embedded containment liner was designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, corrosion for inaccessible areas of the containment is not expected to be significant. The staff finds that applicant's inspections and tests in accordance with the Inservice Inspection Program - IWE and 10 CFR Part 50, Appendix J to manage loss of material due to general pitting and crevice corrosion are adequate and no additional plant-specific program is required.

In addition, the staff noted that, borated water spills, when detected, are cleaned up promptly in accordance with the applicant's Boric Acid Corrosion Program. The Boric Acid Corrosion Control Program provides additional assurance that the effects of aging will be adequately managed. The staff's evaluation of the Boric Acid Corrosion Program is documented in SER Section 3.0.3.2.1.

During interviews and discussions with the applicant's staff, the staff noted that ACI 201.2R was not used as guidance for concrete mix proportions, but ACI 211.1-74 was followed. ACI 211.1-74 provides guidance for producing high-density, low permeability concrete mix designs similar to ACI 201.2R. The staff asked the applicant to provide a comparison of the similarities and differences between ACI 201.2R and ACI 211.1-74 for concrete mix proportion designs as they relate to VEGP concrete specifications.

The applicant responded that VEGP concrete was designed and constructed in accordance with ACI 318-71, ACI 304-73 and ACI 211.1-74, ACI 211-74, "Recommended Practice for Selecting Proportions for Normal and Heavy Weight Concrete," was used as guidance for concrete mix proportions, which provides guidance for providing for high-density, low-permeability concrete mix designs equivalent to ACI 201.2R "Guide to Durable Concrete".

Water-cement ratio is of primary importance for less permeable concrete which provides greater assurance against corrosion. The applicant stated that selection of the water-cement methodology is the same between the ACI 211.1-74 and ACI 201.2R. Both ACI 211.1-74 and ACI 201.2R specify a maximum water-cement ratio of 0.50 for "All other structures" which applies to VEGP containment concrete. Within the water-cement ratios specified in both ACI Codes, the actual concrete mix designs at VEGP were 0.4 to 0.45.

Air entrainment is also an important element in designing a durable, low permeable concrete. The applicant stated that selection of the air content is similar between the two

ACI codes. ACI 211.1-74 specifies a maximum air content of 6 percent for moderate exposure. ACI 201.2R recommends an average air content of 5 percent for a Moderate Zone with a 1½ percent tolerance, which would be equivalent to 3½ percent to 6½ percent. Within the air content specified in both ACI Codes, the actual mix designs at VEGP for the containment were 3 percent to 6 percent.

The staff concludes that the applicant's response is acceptable since the concrete air content of 3 percent to 6 percent, and water to cement ratio of 0.35 -0.45 is consistent with the GALL Report recommendations.

Based on the programs identified above, the staff concludes that the applicant's programs 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 concludes 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 Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature</u>. 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 defined in 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.

<u>Cumulative Fatigue Damage</u>. LRA Section 3.5.2.2.1.6 states that fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) are TLAAs as defined in 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.

<u>Cracking Due to Stress Corrosion Cracking</u>. The staff reviewed LRA Section 3.5.2.2.1.7 against the criteria in SRP-LR Section 3.5.2.2.1.7.

LRA Section 3.5.2.2.1.7 addresses cracking due to stress corrosion cracking of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds, stating that further evaluation is recommended to ensure that this aging effect is adequately managed. The VEGP AMR results conclude that cracking due to SCC is not an aging effect requiring management for VEGP stainless steel containment penetration sleeves, bellows, and dissimilar metal welds. Both high temperature (> 140 °F) and exposure to an aggressive environment are required for SCC to be applicable. At VEGP, these two conditions are not simultaneously present for any stainless steel penetration sleeves, bellows, or dissimilar metal welds. Further, reviews of VEGP plant-specific operating experience did not identify any SCC of these components.

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.

On the basis of its audit and review, the staff concludes that cracking due to SCC for penetration sleeves and bellows, and dissimilar metal welds is not applicable to VEGP since the conditions necessary for SCC, both high temperature(>140 °F) and exposure to an aggressive environment, do not simultaneously exist.

On the basis that the conditions necessary for SCC do not exist, the staff concludes that this aging effect is not applicable to VEGP.

<u>Cracking Due to Cyclic Loading</u>. The staff reviewed LRA Section 3.5.2.2.1.8 against the criteria in SRP-LR Section 3.5.2.2.1.8.

LRA Section 3.5.2.2.1.8 addresses cracking due to cyclic loading in shells and penetrations, stating that the VEGP AMR results conclude that cracking due to cyclic loading for containment components without CLB fatigue analyses is not an aging effect requiring management. These components are designed to withstand operating stress levels and as such, cracking due to cyclic loading is unlikely to occur. Further, reviews of VEGP operating experience did not identify any events related to cyclic loading induced cracking of containment components. This subsection also lists components associated with BWR primary containment that require aging management for crack initiation and growth due to SCC. These components are not applicable to VEGP since it is a PWR.

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.

During interviews and discussions with the applicant’s staff, the applicant stated that the VEGP containment penetrations that experience significant cyclic loading have fatigue analyses that are evaluated as TLAAs. SER Section 4.3.1 “Fatigue of ASME Class 1 Components” and SER Section 4.6 “Penetration Load Cycles” document the staff’s review of the applicant’s evaluation of these TLAAs. The containment components without CLB fatigue analyses are designed to withstand operating stress level. The staff concludes that this aging effect is not applicable to VEGP for containment components without CLB fatigue analyses.

<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.

LRA Section 3.5.2.2.1.9 addresses loss of material (scaling, cracking, and spalling) due to freeze-thaw in concrete containments, stating that loss of material due to freeze-thaw effects is not an aging effect requiring management for VEGP. VEGP is located very close to the region of negligible weathering conditions based on ASTM C33. Normal winter temperatures are mild, with normal winter lows only in the mid 30s. Concrete structures at VEGP were designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well cured, and low permeability concrete. Concrete structures are not exposed to saturated water conditions.

Examinations of the accessible concrete performed by the Inservice Inspection Program - IWL have not identified any degradation due to freeze-thaw effects.

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.

On the basis of its audit and review, the staff finds that loss of material (scaling, cracking, and spalling) due to freeze-thaw is not an aging mechanism requiring management because of the weathering conditions and concrete specifications at VEGP. Operating experience also demonstrates that there is no identified degradation due to freeze-thaw effect.

On the basis that the conditions necessary for freeze-thaw do not exist, the staff concludes that this aging effect is not applicable to VEGP.

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.

LRA Section 3.5.2.2.1.10 addresses cracking due to expansion and reaction with aggregate, and to increase in porosity and permeability due to leaching of calcium hydroxide in concrete elements of containments, stating that cracking due to expansion and reaction with aggregate is not an aging effect requiring management for VEGP. Concrete aggregates used in VEGP concrete structures were selected per ASTM C33, which uses ASTM C295 "Petrographic Examination of Aggregates for Concrete". Aggregates identified as potentially reactive were not used at VEGP.

Loss of material due to leaching of calcium hydroxide is conservatively considered to be an aging effect requiring management for VEGP. There have been minor indications of leaching in below grade concrete in VEGP structures other than the Containment Building. Leaching of calcium hydroxide from reinforced concrete becomes significant only if the concrete is exposed to flowing water. Resistance to leaching is enhanced by using a dense, well-cured concrete with low permeability. The VEGP containment structure and the other in-scope structures are not exposed to flowing water. These structures are designed in accordance with ACI 318 and constructed in accordance with ACI 301 and ASTM standards. VEGP manages loss of material due to leaching of calcium hydroxide with the Inservice Inspection Program - IWL, and the Structural Monitoring Program. The Structural Monitoring Program for VEGP will be enhanced to include requirements to inspect the condition of below grade concrete when it is exposed during excavation. These aging management activities are consistent with the GALL Report.

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.

On the basis of its audit and review, the staff concludes that cracking due to expansion and reaction with aggregate are not aging effects for concrete elements of VEGP containments because selection of nonreactive concrete aggregates is in accordance with ASTM C33, which uses ASTM C295 and the applicant has conservatively managed any potential aging effect with the applicant's Inservice Inspection Program - IWL and the Structural Monitoring Program.

During the audit, the applicant stated that the concrete construction for the VEGP containment structure and the other in-scope structures meets the requirements of guideline ACI 211.1-74, which guided concrete mix proportions, and provides guidance similar to that of ACI 201.2R for high-density, low-permeability concrete mix designs (see staff evaluation for LRA Section 3.5.2.2.1.4 above). However, there have been minor indications of leaching in below grade concrete in VEGP structures other than Containment Building. For conservativeness, the staff concludes that loss of material due to leaching of calcium hydroxide is an aging effect for concrete elements of containments. In the LRA, the applicant proposed to manage this aging effect using the Inservice Inspection Program - IWL, which imposes the inservice inspection requirement of ASME Section XI, Subsection IWL, and the Structural Monitoring Program. The staff's evaluations of the Inservice Inspection Program – IWL and the Structural Monitoring Program are documented in SER Section 3.0.3.3.10 and Section 3.0.3.2.17, respectively.

Because the VEGP concrete is constructed equivalent to the recommendations in ACI 202.2R, the staff finds that applicant's inspections in accordance with the Inservice Inspection Program - IWL and the Structures Monitoring Program to manage loss of material due to leaching of calcium hydroxide are adequate and no additional plant-specific program is required.

During the audit and review, the staff noted that in LRA Table 3.5.1, Item 3.5.1-15 refers to LRA Subsection 3.5.2.2.1.10 in the discussion column. In Subsection 3.5.2.2.1.10, the applicant states that VEGP manages loss of material due to leaching of calcium hydroxide with the Inservice Inspection Program - IWL, and the Structural Monitoring Program. However, in the discussion column, the applicant states that VEGP manages loss of material due to leaching of calcium hydroxide with the Inservice Inspection Program – IWL. The staff asked the applicant to clarify whether the Structural Monitoring Program is also credited to manage loss of material due to leaching of calcium hydroxide.

In its response, the applicant stated that Inservice Inspection Program – IWL is used only for accessible containment concrete. VEGP Containment concrete was constructed using ACI 211.1, which provides guidance for producing high density, low permeability concrete mix designs similar to ACI 201.2R. Further evaluation in accordance with NUREG-1801 is not required. The applicant also stated that the last sentence in the discussion column of Item Number 3.5.1-15 "See Section 3.5.2.2.1.10 for further discussion." will be deleted. On the basis of this response, the LRA will be amended to incorporate this clarification to LRA Table 3.5.1, Item 3.5.1-15; the staff's question is resolved. The staff confirmed that by letter dated February 8, 2008, the applicant corrected this discrepancy.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.5.2.2.1.10 criteria. The staff concludes 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 Structures and Component Supports

The staff reviewed LRA Section 3.5.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2, which address several areas:

Aging of Structures Not Covered by Structures Monitoring Program. The staff reviewed LRA Section 3.5.2.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.2.1.

LRA Section 3.5.2.2.2.1 addresses certain structure/aging effect combinations if not covered by the structural structures monitoring program, stating that further evaluation is necessary only for structure/aging effect combinations not covered by the structures monitoring program. Additionally, further evaluation is recommended to address wear of Group 4 Lubrite components if not included in the Structural Monitoring Program or Inservice Inspection Program - IWF.

The VEGP AMR results conclude that only corrosion of embedded steel, and leaching of calcium hydroxide are applicable to VEGP due to the type of construction and design, geographic location, and below grade water chemistry of VEGP. For steel elements, loss of material due to corrosion is the only applicable aging effect requiring management. However, all VEGP in-scope structures are managed by the Inservice Inspection Program and/or the Structural Monitoring Program. These programs will identify cracking, loss of material, and change in material properties irrespective of the underlying mechanism.

For degradation due to aggressive chemical attack, freeze-thaw, expansion and reaction with aggregates, and cracks and distortion due to increased stress levels, the bases for these VEGP results are the same as presented for the Containment Building. See LRA Sections 3.5.2.2.1.1, 3.5.2.2.1.2, 3.5.2.2.1.3, 3.5.2.2.1.4, 3.5.2.2.1.5, 3.5.2.2.1.9, 3.5.2.2.1.10. See LRA Section 3.5.2.2.2.2(4) for discussion regarding aggressive chemical attack. For reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation and lockup due to wear, see below.

Reduction in foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management at VEGP. VEGP structures are not constructed of porous concrete. Concrete was provided in accordance with ACI and ASTM requirements resulting in dense, well-cured, high strength concrete with low permeability. Structures at VEGP are monitored for settlement and no indication of excessive differential settlement has been detected.

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 will not score or mar. Therefore, lock-up due to wear for Lubrite plates is not an aging effect requiring management at VEGP. Nonetheless, Lubrite plates inspections performed by the Structural Monitoring Program and Inservice Inspection Program (IWF) confirm the absence of wear.

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.

On the basis of its audit and review, the staff concludes that all VEGP in-scope structures are managed by the Inservice Inspection Program and/or the Structural Monitoring Program. These programs identify cracking, loss of material, and change in material properties irrespective of the underlying mechanism. The staff finds the Inservice Inspection Program and/or the Structures Monitoring Program acceptable for managing the above structure-aging effect combinations, as those combinations are applicable. The staff's evaluations of the Structures Monitoring Program and the Inservice Inspection Program (IWF) are documented in SER Section 3.0.3.2.17 and Section 3.0.3.3.4, respectively.

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 concludes 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 criteria in SRP-LR Section 3.5.2.2.2.2:

(1) LRA Section 3.5.2.2.2.2 addresses loss of material and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures, stating that this is not an aging effect requiring management because the AMR results conclude that freeze-thaw is not significant at VEGP. The basis for this conclusion in structures other than containment is the same as the basis for the Containment Building. See LRA Section 3.5.2.2.1.9, which provides discussion related to freeze-thaw effects for all VEGP concrete structures within the scope of license renewal.

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.

On the basis of its audit and review, the staff finds that loss of material and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures are not aging effects requiring management due to the weathering conditions and concrete specifications at VEGP. Operating experience also demonstrates that there is no identified degradation due to freeze-thaw effect.

On the basis that the conditions necessary for freeze-thaw do not exist, the staff concludes that this aging effect is not applicable to VEGP.

(2) LRA Section 3.5.2.2.2.2 addresses cracking due to expansion and reaction with aggregates in below-grade inaccessible concrete areas of Groups 1-5, and 7-9 structures, stating that this is not an aging effect requiring management because the AMR results conclude that cracking due to expansion and reaction with aggregates is not significant at VEGP. The basis for this conclusion in structures other than containment is the same as the basis for the Containment Building. See LRA Section 3.5.2.2.1.10, which provides discussion related to concrete expansion and aggregate reactions for all VEGP concrete structures within the scope of license renewal.

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.

On the basis of its audit and review, the staff concludes that cracking due to expansion and reaction with aggregates for below-grade inaccessible concrete areas of Group 1-5 and 7-9 structures are not plausible aging effects at VEGP due to concrete being constructed in accordance with ACI and ASTM standards with a high cement/low water ratio (see Loss of Material Due to General, Pitting and Crevice Corrosion in SER Section 3.5.2.2.1). Nonetheless, the above aging effects for inaccessible areas of these groups are conservatively included within the Structures Monitoring Program by the applicant. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff concludes that applicant's inspections in accordance with the Structures Monitoring Program to manage cracking due to expansion and reaction with aggregates are acceptable and adequate, and further evaluation is not required.

(3) LRA Section 3.5.2.2.2.2 addresses cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures, stating that this is not an aging effect requiring management because the AMR results conclude that cracking and distortion due to increased stress levels from settlement is not significant at VEGP. The basis for this conclusion in structures other than containment is the same as the basis for the Containment Building. See LRA Section 3.5.2.2.1.2, which provides discussion, related to cracking and distortion due to increased stress levels for all VEGP concrete structures within the scope of license renewal.

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.

On the basis of its audit and review, the staff concludes that cracking 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 for below-grade inaccessible concrete area of Group 1-3, 5 and 7-9 structures are not plausible aging effects due to the nonexistence of these aging mechanisms. The aging effects due to settlement are not expected for the VEGP structures because they are founded on consolidated backfill that is not subject to significant settlement. In addition, porous concrete was not utilized in the construction of the concrete foundations at VEGP. However, the above aging effects for inaccessible areas of these groups are conservatively included within the Structures Monitoring Program by the applicant. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff concludes that applicant's inspections in accordance with the Structures Monitoring Program to detect cracking and distortion due to increased stress levels from settlement are acceptable and adequate, and further evaluation is not required.

(4) LRA Section 3.5.2.2.2.2 addresses aging management of inaccessible concrete areas exposed to an aggressive environment, stating that possible aging effects are increases in porosity and permeability, cracking, and loss of material due to aggressive chemical attack and cracking, loss of bond, and loss of material due to corrosion of embedded steel. Periodic monitoring of below-grade water chemistry is recommended as an acceptable approach to demonstrate that the below-grade environment is not aggressive. Aggressive chemical attack is not applicable to VEGP. Reinforced concrete structures at VEGP were designed, constructed, and inspected in accordance with applicable ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. The mixes were designed with entrained air content between 3% and 6%, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. Crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Groundwater analyses conducted at VEGP confirm that the groundwater is not aggressive. Corrosion of embedded steel is conservatively assumed to be applicable at VEGP since embedded plates that are exposed to humid air and outdoor conditions may be susceptible to corrosion. Other component locations, such as steel reinforcement (rebar) and steel inserts are protected by the surrounding concrete. VEGP concrete structures and structural members were designed and constructed in accordance with ACI and ASTM standards which provide a good quality, dense, low permeability concrete that provides adequate concrete cover over the embedded steel. The concrete at VEGP is not exposed to aggressive groundwater. These factors are likely to prevent significant corrosion. However, inspections performed in accordance with the Structural Monitoring Program are conservatively credited to detect any visible corrosion.

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.

On the basis of its audit and review, the staff concludes that increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack are not plausible aging effects for below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures because VEGP is neither located in areas exposed to sulfate or chloride attack, nor is it located near industrial plants whose emissions could alter environmental parameters. Groundwater analyses also confirm that the VEGP site groundwater is not aggressive. The VEGP concrete structure uses a dense, low permeable concrete with a maximum water-cement ratio of 0.45, which provides an acceptable degree of protection against aggressive chemical attack (see SER Section 3.5.2.2.1).

The staff noted that cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are conservatively considered to be aging effects for below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures since embedded plates that are exposed to humid air and outdoor conditions may be susceptible to corrosion. Since the Groups 1-3, 5, and 7-9 structures inaccessible areas are not in an aggressive environment, the applicant's inspections in accordance with the Structures Monitoring Program to detect visible corrosion are adequate and no additional plant-specific program is required. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17.

During the audit and review, the staff noted that LRA Table 3.5.1, Item 3.5.1-31, refers to LRA Subsection 3.5.2.2.2.2(4) in the discussion column. In Subsection 3.5.2.2.2.2(4), the applicant states that the inspections are performed in accordance with Inservice Inspection Program - IWL and the Structural Monitoring Program and are conservatively credited to detect any visible corrosion. However, in the discussion column, the applicant states that the VEGP Structural Monitoring Program (Appendix B.3.32) will manage degradation of accessible and inaccessible concrete components due to corrosion of embedded steel. The staff asked the applicant to explain whether the ISI-IWL is credited to manage concrete components associated with Item 3.5.1-31 due to corrosion of embedded steel.

In its response, dated February 8, 2008, the applicant stated that Item 3.5.1-31 is applicable to below grade concrete elements for non-containment structures. So, the Inservice Inspection Program - IWL is not credited to manage concrete components associated with Item 3.5.1-31 due to corrosion of embedded steel. Therefore, LRA Subsection 3.5.2.2.2.2(4) will be modified to delete reference to IWL Program. By letter dated March 20, 2008, the staff verified that the applicant amended the LRA 3.5.2.2.2.2(4) to correct this discrepancy.

During the audit and review, the staff noted that in LRA Table 3.5.2-6, ID 6, for NSCW cooling tower basin component in soil environment, GALL Item III.A3-9 is referenced. The staff finds that GALL Item III.A3-9 is associated with air-indoor uncontrolled or air-outdoor environment, while GALL Item III.A3-4 is associated with a ground water/soil environment. The staff asked applicant to clarify why GALL Item III.A3-4 is not used here whether the Structures Monitoring Program is also needed to manage inaccessible concrete components if GALL Item III.A3-4 is more suitable.

In its response, the applicant stated that this is an inadvertent error. GALL Item III.A3-4 should be listed for ID 6 instead of GALL Item III.A3-9, and the corresponding Table 1 Item should be 3.5.1-31. The Structural Monitoring Program is the appropriate aging management program for accessible or inaccessible concrete components and the LRA Table 3.5.2-6 will be amended to incorporate this clarification.

On the basis of its review of the applicant's response, the staff finds the response acceptable because Structural Monitoring Program is the appropriate aging management program for accessible or inaccessible concrete components and the applicant appropriately addressed the aging effect/mechanism, as recommended by the GALL Report.

(5) LRA Section 3.5.2.2.2.2 addresses increases in porosity and permeability due to leaching of calcium hydroxide in below-grade inaccessible concrete areas in Groups 1-3, 5, and 7-9 structures, stating that an aging management program is recommended only if the concrete was not constructed in accordance with the recommendations in ACI 201.2R. Otherwise, an aging management program is recommended. The VEGP AMR results conservatively include increases in porosity and permeability due to leaching of calcium hydroxide. The basis for this conclusion in structures other than containment is the same as the basis for the Containment Building. See LRA Section 3.5.2.2.1.10, which provides discussion related to leaching of calcium hydroxide for all VEGP concrete structures within the scope of license renewal.

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.

On the basis of its audit and review, the staff concludes that increases in porosity and permeability, and loss of strength due to leaching of calcium hydroxide are not plausible aging effects for below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures because concrete construction at VEGP meets the requirements of guideline ACI 211.1-74, which guided concrete mix proportions, and provides guidance similar to that of ACI 201.2R for high-density, low-permeability concrete mix designs (see SER Section 3.5.2.2.1). However, the above aging effects for inaccessible areas of these groups are conservatively included within the Structures Monitoring Program by the applicant. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff finds that applicant's inspections in accordance with the Structures Monitoring Program to manage increases in porosity and permeability, and loss of strength due to leaching of calcium hydroxide are acceptable and adequate, and further evaluation is not required.

Based on the programs identified above, the staff concludes that the applicant's programs meet 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 concludes 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.

LRA Section 3.5.2.2.2.3 addresses reduction of strength and modulus of concrete due to elevated temperatures in Groups 1-5 concrete structures, stating that for any concrete elements that exceed 150 °F for general areas and 200 °F for local areas, further evaluation and implementation of a plant-specific program is recommended.

With the exception of small localized areas in the Auxiliary Building, all VEGP structures within the scope of license renewal remain at temperatures less than 150 °F. There are small localized areas in Level B of the Auxiliary Building where the maximum assumed temperature could at times possibly reach 155 °F (per VEGP UFSAR Table 3.11.B.1-1). This room does not contain any safety-related equipment/instrumentation. In summary, temperatures in Groups 1-5 concrete structures do not exceed 150 °F for general areas and 200 °F for local areas and therefore no additional aging management is warranted.

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)).

On the basis of its audit and review, the staff concludes that the reduction of strength and modulus for Groups 1-5 concrete structures due to elevated temperature are not plausible aging effects due to the nonexistence of these aging mechanisms. The aging effects due to elevated temperature are not expected at VEGP for Group 1-5 concrete structures since no portion of these components exceed specified temperature limits, which are 150 °F for general area and 200 °F for local area.

The staff concludes that there are no components from this group, that are subject to elevated temperatures, therefore; this aging effect is not applicable to the VEGP Groups 1-5 structures.

Aging Management of Inaccessible Areas for Group 6 Structures. The staff reviewed LRA Section 3.5.2.2.2.4 against the following criteria in SRP-LR Section 3.5.2.2.2.4:

LRA Section 3.5.2.2.2.4 addresses evaluation of inaccessible concrete areas of Group 6 structures due to 1) aggressive chemical attack and corrosion of embedded steel; 2) freeze-thaw; and 3) leaching of calcium hydroxide, stating that these aging effects are not applicable because Group 6 structures are described as water control structures in NUREG-1801. The VEGP design does not include any Group 6 water control structures in the scope of license renewal. Refer to the VEGP position on Regulatory Guide 1.127 in UFSAR Section 1.9.127.

On the basis of its audit and review, the staff concludes that (1) 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, (2) loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures, and (3) cracking due to expansion and reaction with aggregates and increased porosity and permeability and loss of strength due to leaching of calcium hydroxide below-grade inaccessible reinforced concrete areas of Group 6 structures, are not aging effects requiring management at VEGP since VEGP design does not include any Group 6 water control structures in the scope of license renewal.

On the basis that VEGP does not have any components from this group, the staff finds that this aging effect is not applicable to VEGP.

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.

LRA Section 3.5.2.2.2.5 addresses cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion for Group 7 and 8 stainless steel tank liners exposed to standing water, stating that VEGP uses stainless steel tank liners for the Refueling Water Storage Tanks, Reactor Makeup Water Storage Tanks, and Condensate Storage Tanks. Tank liners are evaluated with their respective mechanical systems. AMR results for these liners are presented in LRA Tables 3.2.2-2, 3.3.2-26, and 3.4.2-4 for the Refueling Water Storage Tanks, Reactor Makeup Water Storage Tanks, and Condensate Storage Tanks, respectively.

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.

On the basis of its audit and review, the staff concludes that cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion are aging effects for Group 7 and 8 stainless steel tank liners exposed to standing water. In applicant’s LRA, the stainless steel tank liners of the Refueling Water Storage Tanks, Reactor Makeup Water Storage Tanks, and Condensate Storage Tanks are evaluated under the mechanical scoping and AMR results with their respective mechanical systems Emergency Core Cooling System, Reactor Makeup Water Storage System, and Auxiliary Feedwater system. The staff's reviews of associated AMRs for these mechanical systems are documented in SER Section 3.2.2.1, Section 3.3.2.2, and Section 3.4.2.2. The staff's evaluations of the related AMPs are documented in SER Section 3.0.3.1.2 "One-Time Inspection Program" and SER Section 3.0.3.1.4 "Water Chemistry Control Program".

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 concludes 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>Aging of Supports Not Covered by the Structures Monitoring Program</u>. The staff reviewed LRA Section 3.5.2.2.2.6 against the criteria in SRP-LR Section 3.5.2.2.2.6.

LRA Section 3.5.2.2.2.6 addresses further evaluation of certain component support/aging effect combinations if they are not covered by the Structural Monitoring Program. This includes (1) loss of material due to general and pitting corrosion associated with Groups B2-B5 supports; (2) reduction in concrete anchor capacity due to degradation of the surrounding concrete associated with Groups B1-B5 supports; and (3) reduction/loss of isolation function due to degradation of vibration isolation elements associated with Group B4 supports.

For items (1) through (3), the VEGP responses are shown below:

(1) Consistent with NUREG-1800, VEGP manages loss of material due to corrosion in Groups B2-B5 supports with the Structural Monitoring Program.

(2) Consistent with NUREG-1800, VEGP manages reduction in concrete anchor capacity due to degradation of the surrounding concrete with the Structural Monitoring Program.

(3) This item is not applicable to VEGP. VEGP does not have any supports with vibration isolation elements which require AMR. The vibration isolation elements identified by the VEGP integrated plant assessment were determined to be integral parts of active equipment.

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.

On the basis of its audit and review, the staff concludes that reduction and loss of isolation function due to degradation of vibration isolation elements for Group B4 supports is not an aging effect requiring management at VEGP since there are no vibration isolation components within the scope of license renewal.

On the basis of its audit and review, the staff concludes that the applicant has included the component support-aging effect combinations for loss of material due to general and pitting corrosion associated with Groups B2-B5 supports, and reduction in concrete anchor capacity due to degradation of the surrounding concrete associated with Groups B1-B5 supports within the scope of its Structures Monitoring Program. On this basis, the staff concludes that no further evaluation is required. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.17. The staff finds the applicant's Structures Monitoring Program acceptable for managing the above component support-aging effect combinations, as those combinations are applicable.

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 concludes 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.

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.

3.5.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

The staff reviewed the LRA Tables 3.5.2-1 through 3.5.2-12 for 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 3.5.2-12, 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.

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 Containment Structures - Summary of Aging Management Review – LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of AMR evaluations for the containment structures component groups.

The applicant states that there is no aging effect to be managed for the period of extended operation for penetration component (containment boundary) with stainless steel material.

The staff reviewed the LRA, and interviewed the applicant's technical staff and found that cracking due to SCC is not an AERM for stainless steel containment penetration sleeves, bellows, and dissimilar metal welds. The staff noted that both high temperature (greater than 140ºF) and exposure to an aggressive environment are required for SCC. At VEGP, these two conditions are not simultaneously present for any stainless steel penetration sleeves, bellows, or dissimilar metal welds. Further, plant-specific operating experience shows no SCC of these components. 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 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 Auxiliary, Control, Fuel Handling, and Equipment Buildings - Summary of Aging Management Review – LRA Table 3.5.2-2

In Table 3.5.2-2 of the LRA, the licensee summarizes the results of AMR evaluations for the auxiliary, control, fuel handling, and equipment buildings component groups. The staff reviewed LRA Table 3.5.2-2 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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 Emergency Diesel Generator Structures - Summary of Aging Management Review – LRA Table 3.5.2-3

In Table 3.5.2-3 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-3 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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 Turbine Building - Summary of Aging Management Review – LRA Table 3.5.2-4

In Table 3.5.2-4 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-5 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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 Tunnels and Duct Banks - Summary of Aging Management Review – LRA Table 3.5.2-5

In Table 3.5.2-5 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-5 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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 Nuclear Service Cooling Water Structures - Summary of Aging Management Review – LRA Table 3.5.2-6

The staff reviewed LRA Table 3.5.2-6, which summarizes the results of AMR evaluations for the nuclear service cooling water structures component groups.

In LRA Table 3.5.2-6, the applicant proposed to manage Item 3.5.1-32 concrete (interior), concrete material, raw water environment, and aging effect (change of material properties) by using the Structural Monitoring Program.

The staff reviewed the Structural Monitoring Program, and its evaluation is documented in SER Section 3.0.3.2.17. The Structural Monitoring Program description stated that inspection frequencies are determined by the safety significance of each structure. Frequency was based on the safety significant structures and varies from one RFO (18M) to ten year. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that since these components will be visually inspected depending on the safety significance of structures, the aging effect of concrete (interior) component, concrete material is effectively managed using the Structural Monitoring Program.

In LRA Table 3.5.2-6, the applicant proposed to manage concrete material, raw water environment, and aging effect (cracking and loss of material) by using the Structural Monitoring Program.

The staff reviewed the Structural Monitoring Program, and its evaluation is documented in SER Section 3.0.3.2.17. The Structural Monitoring Program description stated that inspection frequencies are determined by the safety significance of each structure. Frequency was based on the safety significance of the structures and varies from one RFO (18M) to ten years. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that since these components will be visually inspected depending on the safety significance of structures, the aging effect of concrete material in raw water environment is effectively managed using the Structural Monitoring Program.

In LRA Table 3.5.2-6, the applicant proposed to manage asbestos cement board material, in water-flowing environment, aging effect is loss of material-erosion by using the Periodic Surveillance and Preventive Maintenance activities.

The staff reviewed the Periodic Surveillance and Preventive Maintenance Activities, and its evaluation is documented in SER Section 3.0.3.3.6. The Periodic Surveillance and Preventive Maintenance Activities description stated that visual inspection of the NSCW Cooling Towers is an existing preventive maintenance task that includes collecting sample specimens of the tower fill and drift eliminators. Failure load testing of the tower fill and drift eliminators has been performed since 1988. Through the latest report in 2003, no specimens have failed to meet the acceptance criteria, and the projected lifetime of the tower fill and drift eliminators indicates that the material deteriorates at a slow rate in the tower environment. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that since these components will be visually inspected at least once every 18 months, the aging effect of asbestos cement board material is effectively managed using the Periodic Surveillance and Preventive Maintenance activities.

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 Concrete Tank and Valve House Structures - Summary of Aging Management Review – LRA Table 3.5.2-7

In Table 3.5.2-7 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-7 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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).

3.5.2.3.8 Switchyard Structures - Summary of Aging Management Review – LRA Table 3.5.2-8

In Table 3.5.2-8 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-8 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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).

3.5.2.3.9 Fire Protection Structures - Summary of Aging Management Review – LRA Table 3.5.2-9

In Table 3.5.2-9 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-9 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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).

3.5.2.3.10 Radwaste Structures - Summary of Aging Management Review – LRA Table 3.5.2-10

In Table 3.5.2-10 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-10 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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).

3.5.2.3.11 Auxiliary Feedwater Pump House Structures - Summary of Aging Management Review – LRA Table 3.5.2-11

In Table 3.5.2-11 of the LRA, the licensee summarizes the results of AMR evaluations for the emergency diesel generator structures component groups. The staff reviewed LRA Table 3.5.2-11 and did not find any line items indicating plant specific notes F through J for which the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. All items in this table correspond to notes A through E in the Gall Report. The staff's evaluation for line items corresponding to plant specific notes A through E is found in section 3.5.2.1.

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).

3.5.2.3.12 Component Supports and Bulk Commodities - Summary of Aging Management Review – LRA Table 3.5.2-12

The staff reviewed LRA Table 3.5.2-12, which summarizes the results of AMR evaluations for the component supports and bulk commodities component groups.

In LRA Table 3.5.2-12, Item 3.5.1-50, the applicant states that conduits component, aluminum material, air – outdoor environment does not have an AERM.

During the audit and review, the staff asked the applicant to explain why VEGP identifies no AERM for Item 3.5.1-50 while GALL Report recommends Structure Monitoring Program (SMP) for GALL Item III.B2-7 to manage the loss of material aging effect. In its response, the applicant stated that, for LRA Table 3.5.2-12; ID 10, and Table 3.5.1, Item 3.5.1-50 will be revised to show SMP to manage aluminum in air-outdoor environment, and change the Note I to Note C. On the basis of its review, the staff finds the applicant response is acceptable, since the aging effect of conduit component, aluminum material is visually inspected per SMP. The staff confirmed that the applicant revised the LRA in a letter dated March 20,2008**.**

In LRA Table 3.5.2-12, the applicant states that cementitious (fire proofing) material does not have an AERM.

The staff reviewed the SRP and GALL Report Recommendation and agreed with the applicant that the sprayed-on or toweled-on fire resistive material has no aging effects requiring aging management. In the course of inspecting the underlying steel surfaces by Structure Monitoring Program, any degradation in the sprayed-on or toweled-on coating would however be identified and remedied in accordance with the applicant’s corrective action program described in LRA.

The staff reviewed the Structural Monitoring Program, and its evaluation is documented in SER Section 3.0.3.2.17. The Structural Monitoring Program description stated that inspection frequencies are determined by the safety significance of each structure. Frequency was based on the safety significance of structures and varies from one RFO (18M) to ten years. On the basis of its review of the applicant’s plant-specific and industry operating experience, the staff finds that since the component will be visually inspected depending on the safety significance of structures, the aging effect of steel material is effectively managed using the Structural Monitoring Program.

During the audit and review, the staff asked the applicant to explain why Note F was used in LRA Table 3.5.2-12, ID 13,GALL Item III.A3-12, for steel material. The Note F states that material not in GALL Report for this component. However, steel material is associated with GALL Item III.A3-12. In its response, the applicant stated that, this is an inadvertent error. Not C should be associated with LRA Table 3.5.2-12, ID 13 instead of Note F. The staff confirmed that the applicant revised the LRA March 20,2008

In LRA Table 3.5.2-12, the applicant proposed to manage Gypsum material; aging effect is cracking by using the Fire Protection Program and Structures Monitoring Program.

The staff reviewed the Fire Protection Program, and its evaluation is documented in SER Section 3.0.3.2.6. The Fire Protection Program basis document description stated that 10 percent of each type of electrical and mechanical penetration seal is visually inspected at least once every 18 months. On the basis of its review of the applicant’s plant-specific and industry operating experience, the staff finds that since these components will be visually inspected at least once every 18 months, the aging effect of gypsum material is effectively managed using the Fire Protection Program.

The staff also reviewed the Structural Monitoring Program, and its evaluation is documented in SER Section 3.0.3.2.17. The Structural Monitoring Program description stated that inspection frequencies are determined by the safety significance of each structure. Frequency was based on the safety significance of structures and varies from one RFO (18M) to ten years. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that since the component will be visually inspected depending on the safety significance of structures, the aging effect of steel material is effectively managed using the Structural Monitoring Program.

In LRA Table 3.5.2-12, the applicant proposed to manage Fire Barrier Assemblies component, Fire proofing material, and aging effect is cracking, change of material properties and separation by using the Fire Protection Program.

The staff reviewed the Fire Protection Program, and its evaluation is documented in SER Section 3.0.3.2.6 The Fire Protection Program basic document description stated that 10 percent of each type of electrical and mechanical penetration seal is visually inspected at least once every 18 months. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that since these components will be visually inspected at least once every 18 months, the aging effect of Fire Barrier Assemblies component, Fire proofing material is effectively managed using the Fire Protection Program.

In LRA Table 3.5.2-12, the applicant proposed to manage Item 3.5.1-56 Lubrite material, is not an AERM.

During the audit and review, the staff asked the applicant to explain why VEGP identifies no AERM for Item 3.5.1-56 (III.B1.1-5) while GALL Report recommends ISI (IWF) Program to manage the loss of mechanical function due to corrosion, distortion, dirt, overload, and fatigue due to vibratory and cyclic thermal loads. In its response, the applicant stated that, this items are for whip restraints in the Auxiliary building, beside, industry experience has shown that Lubrite® materials are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high radiation fields, and do not score or mar. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds the applicant responses 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).

3.5.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the containments, structures, and component 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 controls (I&C) system components and component groups of:

- cable connections (metallic parts) not subject to 10 CFR 50.49 EQ requirements
- conductor insulation for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
- conductor insulation for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements
- connector contacts for electrical connectors exposed to borated water leakage not subject to 10 CFR 50.49 EQ requirements
- fuse holders (not part of a larger assembly): insulation not subject to 10 CFR 50.49 EQ requirements
- fuse holders (not part of a larger assembly): metallic clamps
- high voltage insulators
- switchyard bus and connections
- transmission conductors and connections

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 Electrical Components in Chapter VI of NUREG-1801," 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 audit of AMRs to confirm 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 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 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 or mechanisms, and AMPs listed in LRA Section 3.6 and addressed in the GALL Report.

Table 3.6-1 Staff Evaluation for Electrical and Instrumentation and Controls in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements (3.6.1-1)	Degradation due to various aging mechanisms	Environmental Qualification of Electric Components	Yes	TLAA	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 EQ requirements (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 EQ Requirements	No	Non-EQ Cables and Connections Program (B.3.34)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (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 EQ Requirements	No	Not applicable	Not applicable to VEGP (See Section 3.6.2.1.2
Conductor insulation for inaccessible medium voltage (2 kV to 35 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements (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 EQ Requirements	No	Non-EQ Inaccessible Medium-Voltage Cables program (B.3.35)	Consistent with GALL Report, which recommends no further evaluation (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	No	Boric Acid Corrosion Control Program (B3.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
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	No	Not applicable	Not applicable to VEGP (See Section 3.6.2.3.1
Metal enclosed bus - bus, connections (3.6.1-7)	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	No	Not applicable	Not applicable to VEGP (See Section 3.6.2.1.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
Metal enclosed bus - insulation, insulators (3.6.1-8)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Metal Enclosed Bus	No	Not applicable	Not applicable to VEGP (See Section 3.6.2.1.2)
Metal enclosed bus - enclosure assemblies (3.6.1-9)	Loss of material due to general corrosion	Structures Monitoring Program	No	Not applicable	Not applicable to VEGP (See Section 3.6.2.1.2)
Metal enclosed bus - enclosure assemblies (3.6.1-10)	Hardening and loss of strength due to elastomers degradation	Structures Monitoring Program	No	Not applicable	Not applicable to VEGP (See Section 3.6.2.1.2)
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 aging management program is to be evaluated	Yes	None	Consistent with GALL Report (See SER Section 3.6.2.2.2)
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 aging management program is to be evaluated	Yes	None	Consistent with GALL Report (See SER Section 3.6.2.2.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendments	Staff Evaluation
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	No	Non-EQ Cable Connections One-Time Inspection program (B.3.36)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1.1)
Fuse Holders (Not Part of a Larger Assembly) - insulation material (3.6.1-14)	None	None	No	None	Consistent with GALL Report

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

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:

- Boric Acid Corrosion Control Program
- Non-EQ Cables and Connections Program
- Non-EQ Inaccessible Medium-Voltage Cables Program
- Non-EQ Cable Connections One-Time Inspection Program

LRA Table 3.6.2-1 summarizes AMRs for the electrical and I&C 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 Report 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 Report AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL Report AMPs have been reviewed and accepted. The staff also determined whether the applicant’s AMP was consistent with the GALL Report 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 Report 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 determined 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 Report 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 Report AMPs have been reviewed and accepted. The staff also determined whether the applicant’s AMP was consistent with the GALL Report 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 or NUREG-1801 identifies a plant specific aging management program. The staff audited these line items to verify consistency with the GALL Report.

The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL Report AMP and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit and review of the information provided 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 is discussed below.

3.6.2.1.1 Loosening of Bolted Connections

In the discussion section of Table 3.6.1, Item 3.6.1-13 of the LRA, the applicant stated that loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is managed by Non-EQ Cable Connections One-Time Inspection Program. The staff noted that in the AMR results line in Table 3.6.2-1 that points to Table 3.6.1, Item 3.6.1-13, the applicant included a reference to Note E.

The staff reviewed the AMR results line referenced to Note E and determined that the component type, material, environment, and aging effect are consistent with the corresponding line item of the GALL Report; however, where the GALL Report recommends the AMP XI.E6, "Non-EQ Electrical Cable Connections Program," the applicant has proposed the plant-specific Non-EQ Cable Connections One-Time Inspection Program.

As discussed in SER Section 3.0.3.3.11, the staff finds the Non-EQ Cable Connections One-Time Inspection Program acceptable to manage loosening of Non-EQ bolted cable connections. On this basis, the staff finds that the AMP credited for these AMR result items acceptable.

3.6.2.1.2 AMR Results Identified as Not Applicable

The applicant identified in LRA Table 3.6.1, as "Not Applicable" for line Items 7, 8, 9, and 10 since the component/material/ environment combination that supports a license renewal intended function does not exist at VEGP. For each of these line items, the staff reviewed the LRA and the applicant's supporting documents, and confirmed the applicant's claim that the component/material/environment combination (metal enclosed bus) that supports a license renewal function does not exist at VEGP is acceptable. In addition, for LRA Table 3.6.1, line Item 3, the applicant identified that electrical cables and connections used in instrumentation circuits (nuclear instrumentation and radiation monitoring) is not applicable to VEGP since they are qualified under the EQ program. The staff confirmed that these cables and connections are covered under the VEGP EQ program and therefore, this line item is not applicable to VEGP.

On the basis that VEGP does not have the component/material/ environment combination that supports license renewal function for these GALL Report Table 1 line items, the staff finds that these AMR line items are not applicable to VEGP.

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 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 their 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

In LRA Section 3.6.2.2, the applicant further evaluated 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 EQ
- 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
- QA 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 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

The staff reviewed LRA Section 3.6.2.2.1 against the criteria in SRP-LR Section 3.6.2.2.1.

In LRA Section 3.6.2.2.1, the applicant states that environmental qualification is a TLAA, as defined in 10 CFR 54.3. SRP-LR Section 3.6.2.2.1 states that the applicants are required to evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). The evaluation of the TLAA is addressed in SRP-LR Section 4.4.

SER Section 4.4 documents the staff's review of the applicant's evaluation of this TLAA. Based on the review, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.6.2.2.1.

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.

LRA Section 3.6.2.2.2 addresses degradation of insulation quality due to salt deposits or surface contamination on high-voltage insulators as an aging effect not applicable to VEGP.

Various airborne materials (*e.g.*, dust, salt and industrial effluents) can contaminate insulator surfaces. Surface contamination can be a problem in areas of concentrations of airborne particles near facilities that discharge soot or in areas near the ocean where salt spray is prevalent. A large buildup of contamination facilitates conductor voltage tracking along the surface and can lead to insulator flashover. Surface contamination buildup is typically a gradual process even slower in rural areas with fewer suspended particles and less concentrated sulfur dioxide in the air than in urban areas. VEGP is located in a rural area with comparatively low airborne particle concentrations. Consequently, the rate of contamination buildup on the high-voltage insulators is not significant and washed away naturally by rainwater. The glazed surface of the high-voltage insulators aids in the removal of this contamination. Degradation of insulation quality due to surface contamination or salt deposits is not an AERM for the high-voltage insulators within the scope of this review.

Loss of material due to mechanical wear is an aging effect for strain and suspension insulators subject to significant movement. Movement of the insulators can be caused by wind causing the supported transmission conductor to swing from side to side. If frequent enough, such swinging could cause wear in the metal contact points of the insulator string and between the insulator and supporting hardware. Although this mechanism is possible, operating experience shows that transmission conductors normally do not swing and when they do, because of strong winds, they dampen quickly when the wind subsides. The transmission conductors within the scope of license renewal are short spans within the low-voltage switchyard and between the low-voltage and high-voltage switchyards with no large surface area exposed to wind loads. The spans are approximately 466 feet long; therefore, tension on the conductors is less than that on typical applications of up to 1000 feet. Although rare, surface rust may form where the galvanizing burns off due to flashover from lightning strikes. Surface rust is not a significant concern and would not cause a loss of intended function if unmanaged. Loss of material due to wear is not an AERM for the high-voltage insulators within the scope of this review.

For validation of the AMR results and assurance of no additional aging effects, industry and plant-specific operating experience including staff generic communications on high-voltage insulators show no unique aging effects beyond those addressed in this section. There are no AERMs for the high-voltage insulators.

SRP-LR Section 3.6.2.2.2 states that degradation of insulator quality due to presence of any salt deposits and surface contamination could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution). Loss of material due to mechanical wear caused by wind blowing on transmission conductors could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

Staff Evaluation

Since VEGP is not located near facilities that discharge soot or near the sea coast and the applicant's plant-specific operating experience did not identify any issues associated with degradation of insulator quality, the staff finds that degradation of insulator quality due to salt deposits or surface contamination is not an applicable aging effect requiring management for high-voltage insulators at VEGP.

The staff noted that although loss of material of insulators due to mechanical wear is possible, experience has shown that the transmission conductors do not normally swing significantly. When they do swing due to a substantial wind, they do not continue to swing for a very long time after the wind has subsided. Wind loading that can cause a transmission line and insulators to sway is considered in the applicant's design and installation. The staff also noted that the applicant's routine maintenance inspections have not identified any loss of material of insulators due to mechanical wear. In addition, since the transmission conductors within the scope of license renewal at VEGP are short spans, the surface area exposed to wind loads are not significant. Therefore, the staff concludes that the loss of material due to wear is not considered an aging effect that will cause a loss of intended function of the insulators at VEGP.

Based on the technical justification identified above, the staff concludes that the applicant meets SRP-LR Section 3.6.2.2.2 criteria. The staff concludes that the applicant has addressed the potential degradation of insulators 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 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 in transmission conductors and connections and in switchyard bus and connections are not applicable aging effects to VEGP.

Loss of material for transmission conductor mounting hardware due to wind-induced abrasion and fatigue is an aging mechanism but is not significant enough to require aging management for the period of extended operation. Wind-induced abrasion and fatigue could be caused by transmission conductor movement from wind loading.

Design and installation of the overhead conductors and hardware consider wind loading that could cause a transmission line to swing back and forth. Strong winds could cause the transmission conductors to sway from side to side and, if frequent enough, could cause the transmission conductor mounting hardware to wear. Although this mechanism is possible, operating experience shows that the transmission conductors normally do not swing and when they do, because of strong winds, they dampen quickly when the wind subsides. The VEGP transmission conductors within the scope of this review are relatively short spans, the longest approximately 466 feet; therefore, tension on the conductors is less than that on typical applications of up to 1000 feet in length. Therefore, loss of mounting hardware material caused by transmission conductor vibration (sway) and fatigue is not an AERM.

Loss of transmission conductor strength due to corrosion is an aging effect but ample design margin makes the effect not so significant as to require aging management for the period of extended operation.

All transmission conductors are aluminum conductor steel-reinforced (ACSR) Type constructed of stranded aluminum conductors wound around a steel core, no organic materials.

The most common mechanisms contributing to loss of ACSR transmission conductor strength are steel core corrosion and aluminum strand pitting.

There is a set percentage of composite conductor strength established for transmission conductor replacement. The National Electrical Safety Code (NESC) requires tension on installed conductors at a maximum of 60 percent of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under various loads of ice, wind, and temperature. Tests by Ontario Hydroelectric showed a 30-percent loss of composite conductor strength in an 80-year old transmission conductor due to corrosion. Assuming a 30-percent loss, there still would be significant margin between actual conductor strength and what the NESC requires.

VEGP transmission conductors are designed to withstand standard light and medium loads; therefore, the Ontario Hydroelectric heavy-loading zone study is conservative. The conductors with the smallest ultimate strength margin (795,000 circular mils (795 MCM) ACSR) illustrate the point. The ultimate strength and the maximum design tension of 795 MCM ACSR are 31,200 lbs. and 10,920 lbs., respectively. The margin between the ultimate strength and the maximum design tension is 20,280 lbs. (*i.e.*, a 65-percent ultimate strength margin). For 795 MCM ACSR transmission conductors, a 30-percent loss of ultimate strength means there still would be a 35-percent ultimate strength margin between actual strength in an 80-year old conductor and what the NESC requires.

This analysis shows ample design margin in the transmission conductors making the aging effect not significant enough to require aging management for the period of extended operation. Because of the conservative ultimate strength margin, loss of conductor strength is not an AERM for the ACSR transmission conductors within the scope of this review.

Transmission conductors and connections include the transmission conductors and the hardware securing them to high-voltage insulators but not electrical connections from the transmission conductors down to equipment. These connections are in the switchyard bus and connections commodity group. As such, increased connection resistance is not an AERM.

For validation of the AMR results and assurance of no additional aging effects, industry and plant-specific operating experience, including staff generic communications on transmission conductors and connections, show no unique aging effects beyond those addressed in this section.

The Ontario Hydroelectric test conservatism in strength margin applied to the conductors demonstrates with reasonable assurance that loss of material from the VEGP ACSR transmission conductors is acceptable for the period of extended operation without additional aging management and that the transmission conductors will have ample strength margin to perform intended functions throughout the renewal term without an AMP.

Because of the materials in use, the Ontario Hydroelectric test results, the staff generic communications, and industry and plant-specific operating experience, there are no AERMs for transmission conductors and connections for the period of extended operation.

The switchyard buses within the scope of this review are constructed of tubular aluminum pipe, all-aluminum cable, and ACSR. The switchyard buses consist of short lengths of aluminum pipe and flexible cable conductors that normally do not vibrate and are supported by insulators mounted to static, structural components like cement footings and structural steel. For this design configuration, wind-induced vibration is not an aging mechanism. With no connections to moving or vibrating equipment, loss of material due to wind-induced abrasion and fatigue is not an AERM for the switchyard buses.

The portions of the switchyard bus and connections within the scope of this review are tubular aluminum pipe, all-aluminum cable, and ACSR. Unlike transmission conductors, none of these components are under tension. Aluminum and steel exposed to switchyard service conditions experience no appreciable aging effects except minor oxidation, which has no impact on the ability of the switchyard bus to perform its intended function; therefore, general corrosion resulting in loss of conductor strength of the switchyard bus is not an AERM.

Switchyard bus connection components are constructed from cast aluminum, galvanized steel, and stainless steel, no organic materials, and switchyard bus connections are welded. Conductor connections generally are bolted. Switchyard components are exposed to precipitation. Connection materials exposed to switchyard service conditions experience no appreciable aging effects except minor oxidation of the exterior surfaces without an impact on the ability of the switchyard bus to perform its intended function.

Bolted switchyard connections have surfaces coated with an anti-oxidant compound (a grease-type sealant) prior to tightening to prevent the formation of oxides on the metal surface and to prevent entry of moisture, thus reducing the chances of corrosion. Operating experience shows this installation method achieves a corrosion-resistant connection with low electrical resistance.

The bus and the overhead transmission conductors have bolted connections. VEGP design uses stainless steel "Belleville" washers on bolted electrical connections to maintain proper torque and prevent loosening. This assembly method is consistent with good bolting practices recommended in EPRI Technical Report 1003471, "Bolted Joint Maintenance and Applications Guide," December 2002. Plant-specific operating experience shows no switchyard bolted connection failures attributed to aging; therefore, oxidation or loss of pre-load resulting in increased connection resistance in switchyard bus connections is not an AERM.

For validation of AMR results and assurance of no additional aging effects, industry and plant-specific operating experience, including staff generic communications on switchyard buses and connections, show no unique aging effects beyond those addressed in this section. Because of the materials in use, the staff generic communications, and industry and plant-specific operating experience, there are no AERMs for switchyard buses and connections for the period of extended operation.

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.

Staff Evaluation

The staff reviewed LRA Section 3.6.2.2.3 and applicant's bases documents. Based on the review, the staff noted that the wind loading that can cause a transmission line and insulator to vibrate is considered in the design and installation. Experience shows that the transmission conductors do not normally swing significantly. When they do swing due to a substantial wind, they do not continue to swing for a very long time after the wind has subsided. In addition, the applicant has confirmed that no plant specific operating experience or no staff's generic communication related to loss of material of transmission conductors due to vibration or sway have been identified. Therefore, the staff finds that loss of material caused by transmission conductor vibration or sway is not an applicable aging effect requiring management at VEGP and it will not cause a loss of intended function of the conductors.

The staff noted that tests by Ontario Hydroelectric showed a 30-percent loss of composite conductor strength of an 80-year old aluminum conductor steel-reinforced (ACSR) conductor due to corrosion. Assuming a 30-percent loss of strength, there would still be significant margin between National Electrical Safety Code requirements and actual conductor strength. VEGP is designed to withstand standard and medium loading conditions; therefore, the Ontario Hydroelectric heavy loading zone study is conservative. Corrosion of a steel core caused by loss of zinc coating or aluminum strand pitting corrosion is a very slow-acting aging effect even slower for areas with fewer suspended particles and sulphur dioxide concentrations in the air than in urban or industrial areas. VEGP transmission conductors do not have air particulate or contaminants as in urban or heavy industrial areas. The staff also noted that to reduce chances of corrosion at VEGP, transmission conductor connection surfaces are coated with an anti-oxidant compound (a grease-type sealant) before the connection is tightened to prevent the formation of oxides on the metal surface or the entry of moisture into the connection. Corrosion is not an aging mechanism requiring management. Furthermore, the staff notes that EPRI 1003057 discusses the aging of high-voltage transmission conductors and determined that the potential aging mechanism of vibration has no significant effects of concern for their intended function.

On the basis of its review, the staff finds that corrosion of ACSR conductor is a very slow acting mechanism and test data from Ontario Hydroelectric, bound the types of conductors at VEGP, which illustrates that transmission conductors will have ample strength through the period of extended operation. Operating experience has found no failure of transmission conductors due to vibration.

Therefore, the staff concludes that there are no applicable AERMs for transmission conductors.

The staff noted that connections to the switchyard bus are welded. However, conductor connections are generally of the bolted category. Components in the switchyard are exposed to precipitation. Connection materials exposed to the service conditions of the switchyard do not experience any appreciable aging effects except for minor oxidation of the exterior surfaces, which does not impact the ability of the switchyard bus to perform its intended function. The staff also noted that pre-load of bolted switchyard bus connections is maintained by the appropriate design and the use of lock and Belleville washers that absorb vibration and prevent loss of pre-load. The torque relaxation for bolted connections is a concern for transmission conductor connections. An electrical connection must be designed to remain tight and maintain good conductivity through a wide temperature range. This design requirement is difficult to meet if the materials specified for the bolt and conductor differ and therefore 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) the joint will be loose when the connection cools. EPRI TR-104213, “Bolted Joint Maintenance & Application Guide,” recommends inspection of bolted joints for evidence of overheating, signs of burning or discoloration, and indications of loose bolts. Operating experience shows this method of installation to provide a corrosion-resistant connection of low electrical resistance. The staff confirmed during the plant walkdown and discussions with the applicant's technical staff that the only bolted transmission conductor connections are those to the high-voltage insulators. Selection of the aluminum bolting hardware for the connection to the switchyard bus was for compatibility with the aluminum connector/conductor coefficient of thermal expansion to maintain the contact pressure of the bolt and washer combination in the connector to the initial vendor-specified torque value. The applicant stated that the connections at the switchyard within the scope of license renewal are periodically evaluated via thermography as preventive maintenance. The staff concludes that the aging mechanism of torque relaxation for bolted connections has been adequately addressed because the design is in accordance with EPRI-104213 recommendations, and periodic thermography of conductor and bus bolted connections and no adverse operating experience conditions existed at VEGP.

The staff also determined that since switchyard buses within the scope of this review are of short lengths of aluminum pipe and flexible cable conductors that normally do not vibrate and are supported by insulators mounted to static, structural components like cement footings and structural steel, wind-induced vibration is not an aging mechanism. With no connections to moving or vibrating equipment, loss of material due to wind-induced abrasion and fatigue is not an AERM for the switchyard buses.

The staff finds that heat created by increased resistance of switchyard bus connections due to increased resistance will be detected using the routine thermography and the VEGP switchyard preventive maintenance program.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.6.2.2.3. For those line items that apply to LRA Section 3.6.2.2.3, the staff concludes that the applicant has addressed loss of material, loss of conductor strength, and increased resistance of connections on loss of preload, 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.

3.6.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

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.

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 Components - Summary of Aging Management Review –
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 components component groups.

<u>Staff Evaluation</u>

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 the applicant 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.

<u>Fuse Holders (Not part of a Larger Assembly Metallic Clamp)</u>.

The LRA Table 3.6.1, Item 3.6.1-6 discussion column states that fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation of fuse holders (not part of a larger assembly) with metallic clamps is not applicable. Therefore, no AMP is required. Also, in LRA Table 3.6.2-1, plant-specific Note 601, the applicant states that it evaluated the aging effect for the fuse holders within the scope of the aging management review.

During the audit and review, the staff discussed with the applicant how it determined the scope of fuses for this evaluation. The applicant stated that VEGP fuse holders were screened against the criteria described in NUREG-1801, Section XI.E5. The vast majority of fuse holders at VEGP are located in active devices, such as control panels, switchgear, MCCs and termination cabinets. To discover the population of fuse holders located outside of these active components, a query was developed showing all VEGP fuses within the scope of license renewal. This produced a list of items. Then, control wiring diagrams, plant engineering expertise, the equipment database, and plant walkdown were used to determine which of these in-scope fuses were located within an active device, so that they could be eliminated from the process.

Based on the review of applicant’s basis documents, plant walkdown results, and technical discussions with the applicant staff, the staff concludes that Fuse Holders (Not part of a Larger Assembly Metallic Clamp) have no aging effects requiring aging management for the following reasons:

- I&C circuits characteristically operate at such low currents that no appreciable thermal cycling or ohmic heating occurs. Since thermal cycling and ohmic heating apply to power supply applications, they are not considered applicable aging mechanisms for I&C fuse holders within the scope of this review.

- The fuses within the scope of this evaluation are not routinely removed for maintenance and/or surveillance testing. Therefore, frequent manipulation is not considered an applicable aging mechanism.

- Vibration is induced in fuse holders by the operation of external equipment, such as compressors, fans, and pumps. The applicant's plant walkdown has verified that there are no direct sources of vibration for the fuse holder panels, and the panels are mounted separately to their own unistrut support structure on a concrete wall or column. Therefore, vibration is not considered an applicable aging mechanism.

- The applicant's plant walkdown has verified that there are no potential sources of chemical contamination in the area, and the fuse holders are totally enclosed in a protective junction box even if chemical contamination were possible. Therefore, based on their installed location and design configuration, chemical contamination is not considered an applicable aging mechanism.

- The applicant's plant walkdown has also verified that the fuse holders within the scope of this evaluation are totally enclosed in protective junction boxes (NEMA 12 rated enclosures). The applicant’s walkdown discovered two panels in the Diesel Fuel Oil Storage Tank Structures which are not NEMA 12 rated. The applicant has verified that these panels have bolted covers with a gasket that prevents any external moisture intrusion. This installed configuration precludes the aging mechanism, as the moisture required to produce corrosion and oxidation is not present in this non-condensing atmosphere.

- The applicant also has verified that there are no sources of potential mechanical system leakage in proximity to the fuse holder junction boxes within the scope of this evaluation.

The staff finds that for this component type, the aging effect is not applicable to VEGP. Therefore, no AMP is required for fuse holders.

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 determined 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 licenses 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, Southern Nuclear Operating Company, Inc. (SNC or the applicant) addressed the TLAAs for Vogtle Electric Generating Plant (VEGP), Units 1 and 2. SER Sections 4.2 through 4.8 documents the review of the TLAAs conducted by the staff of the United States Nuclear Regulatory Commission (NRC) (the staff).

TLAAs are certain plant-specific safety analyses that involve time-limited assumptions defined by the current operating term. Pursuant to 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, pursuant to 10 CFR 54.21(c)(2), applicants must list plant-specific exemptions granted under 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 VEGP against the six criteria specified in 10 CFR 54.3. The applicant indicated that it has identified the calculations that met the six criteria by searching the current licensing basis (CLB). The CLB includes the updated final safety analysis report (UFSAR), engineering calculations, technical reports, engineering work requests, licensing correspondence, and applicable vendor reports. In LRA Table 4.1.2-1, “List of VEGP Time-Limited Aging Analyses,” the applicant listed the applicable TLAAs:

- reactor vessel neutron embrittlement
- metal fatigue
- environmental qualification of equipment
- concrete containment tendon prestress
- penetration load cycles
- leak before break
- diesel fuel oil storage tank corrosion allowance
- steam generator tube, loss of material
- cold overpressure protection system (COPS)

In a letter dated March 20, 2008, the applicant amended the LRA with LRA Section 4.7.5, “Underclad Cracking of the Reactor Pressure Vessel,” which provides the applicant’s time-limited aging analysis for managing underclad cracking in those reactor pressure vessel (RPV) components that are fabricated from SA 508, Class 2 forgings whose internal cladding was welded using a high heat submerged arc weld process.

Pursuant to 10 CFR 54.21(c)(2), the applicant identified exemptions granted under 10 CFR 50.12 based on TLAAs as defined in 10 CFR 54.3. The applicant compiled a list of the exemptions from searches of docketed correspondence, the operating licenses, and the UFSAR, then evaluated each exemption in effect to determine whether it involved a TLAA as defined in 10 CFR 54.3. The applicant listed the following TLAA exemptions in LRA Section 4.1.3, “Identification of Exemptions:”

This evaluation found one exemption meeting the TLAA definition and two not based on TLAAs but permitting changes in TLAA methods. The analyses for these exemptions are included in LRA Table 4.1.2-1.

The first involves an exemption from the 10 CFR 50 Appendix A, General Design Criterion 4 requirement to assume a break “equivalent … to the double-ended rupture of the largest pipe in the reactor coolant system.” A letter dated February 5, 1985, granted VEGP an exemption that eliminated any need (1) to postulate pipe breaks in the primary loop, (2) to install primary loop jet impingement shields and pipe whip restraints, or (3) to consider dynamic effects (*i.e.*, jet impingement loads and blowdown loads in the primary loop and attached piping). LRA Section 4.7.1 describes the leak-before-break analysis.

The second exemption is from 10 CFR Part 50 Appendix G requirements for determining pressure-temperature (P-T) limit curves. This exemption eliminates the flange requirement based on the approved WCAP-16142-P, Revision 1 methodology. LRA Section 4.2.5 describes the P-T analysis.

The third exemption is from the requirements of 10 CFR 50.60, "Acceptance Criteria for Fracture Prevention for Light-Water Nuclear Power Reactors for Normal Operation," permitting the use of ASME Code Case N-514, "Low-Temperature Overpressure Protection" in lieu of the safety margins required by 10 CFR Part 50 Appendix G. LRA Section 4.7.4 describes the COPS setpoint analyses.

4.1.2 Staff Evaluation

LRA Section 4.1 lists the VEGP TLAAs; the applicant also discussed exemptions based on these TLAAs. The staff reviewed the information to determine whether the applicant has provided sufficient information pursuant to 10 CFR 54.21(c)(1) and 10 CFR 54.21(c)(2).

As defined in 10 CFR 54.3, TLAAs meet the following six criteria:

(1) they involve systems, structures, and components within the scope of license renewal, as described in 10 CFR 54.4(a)

(2) they consider the effects of aging

(3) they involve time-limited assumptions defined by the current operating term (40 years)

(4) they are determined to be relevant by the applicant in making a safety determination

(5) they involve conclusions, or provide the basis for conclusions, related to the capability of the system, structure, and component to perform its intended functions, as described in 10 CFR 54.4(b)

(6) they are contained or incorporated by reference in the CLB

The applicant reviewed the list of common TLAAs in 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 VEGP in LRA Table 4.1.2-1.

As required by 10 CFR 54.21(c)(2), an applicant must list all exemptions granted under 10 CFR 50.12, based on a TLAA, and evaluated and justified for continuation through the period of extended operation. The LRA states that each active exemption was reviewed to determine whether the exemption was based on a TLAA. The applicant identified TLAA-based exemptions. Based on the information provided by the applicant regarding the process used to identify these exemptions and its results, the staff concludes that there is one TLAA-based exemption that is justified for continuation through the period of extended operation.

During the audit, the staff noted that polar cranes are within the scope of license renewal, as delineated as Table 2.2-1 of the LRA, but the LRA does not mention whether it requires a TLAA. Therefore, the staff asked the applicant to clarify whether the vendor for the VEGP polar cranes has performed a fatigue analysis for the cranes that is based recommendation for allowable number of maximum load lifts. The applicant stated that an evaluation has been performed and that demonstrates that the actual load cycles for these cranes through the period of extended operation are well below the design limits. In addition, the applicant stated that the polar crane evaluation is based only on assumed loads and does not evaluate a time-dependent aging effect. The staff reviewed the applicant’s response and noted that the evaluations for cranes do not meet the definition of time-limited aging analysis. On this basis, the staff finds the applicant’s response acceptable.

4.1.3 Conclusion

On the basis of its review, the staff concludes that the applicant has provided an acceptable list of TLAAs, as required by 10 CFR 54.21(c)(1). The staff confirmed, as required by 10 CFR 54.21(c)(2), that the applicant has provided an evaluation, as discussed in LRA Section 4.7.1, that justifies the continuation of thee exemption pursuant to 10 CFR 50.12 for the period of extended operation.

4.2 Reactor Vessel Neutron Embrittlement

The regulations that govern reactor vessel integrity are codified in 10 CFR Part 50:

- Section 50.60 of 10 CFR requires all light-water reactors to meet 10 CFR Part 50 Appendices G and H fracture toughness, pressure-temperature (P-T) limits, and material surveillance program requirements for the reactor coolant boundary.
- Section 50.61 of 10 CFR provides fracture toughness requirements for protection against pressurized thermal shock.

Neutron embrittlement describes changes in mechanical properties of reactor vessel (RV) materials in the vicinity of the reactor core beltline region, i.e.; defined by the upper and lower active core planes. The metric of neutron exposure is fluence, i.e., the time integral of neutron flux with energies E>1.0 MeV. The most pronounced material change, relevant to this case, is reduction in fracture toughness with increasing fluence. As fracture toughness decreases with cumulative fast neutron exposure, the material's resistance to crack propagation decreases. Fracture toughness of ferritic materials depends upon temperature. The reference temperature for nil-ductility transition, RT_{NDT}, is the transition temperature above which the material is ductile, and below which is brittle. As neutron fluence increases, the RT_{NDT} increases and higher temperatures are required for the material to remain ductile. This shift in reference temperature is denoted as adjusted reference temperature (ART_{NDT}) and equals the sum $RT_{NDT} + \Delta RT_{NDT}$ where ΔRT_{NDT} is the difference induced by the fluence exposure. Determination of the projected RV reduction in fracture toughness as a function of neutron fluence affects several analyses that support Vogtle Nuclear Plant, Units 1 and 2 (VEGP) operations:

- RV Adjusted Reference-Temperature
- RV Material Upper-Shelf Energy (USE)
- RV Pressurized Thermal Shock (PTS)
- Pressure-Temperature Limits (PT Limits)

As extension of the operating period from 40 years to 60 years will increase neutron fluence, the 60-year fluence value and its impact upon the analyses that support operation must be determined.

4.2.1 Neutron Fluence

4.2.1.1 Summary of Technical Information in the Application

The applicant states that the regulatory requirements in 10 CFR 50.60 and 50.61 are supplemented with 10 CFR 54.21(c)(1)(ii) regarding the required information for TLAA items. The methodology employed in the derivation of the fluence values used in 10 CFR 50.61, the pressure-temperature limits and the low temperature overpressure protection (LTOP) settings are to adhere to the guidance in RG 1.190.

4.2.1.2 Staff Evaluation

The regulatory requirements in 10 CFR 50.60 and 50.61 are supplemented with 10 CFR 54.21(c)(1)(ii) regarding the required information for TLAA items. The methodology employed in the derivation of the fluence values used in 10 CFR 50.61, the pressure-temperature limits and the LTOP limits settings should adhere to the guidance in Regulatory Guide (RG) 1.190. Finally, RG 1.99 for extrapolation of the fluence to ¼T and ¾T locations should be followed.

The staff reviewed the license renewal application (LRA) and found only a statement that the fluence calculation adhered to the guidance of RG 1.190. That was not deemed adequate to conclude adherence to the guidance with RG 1.190, or whether the values listed accounted for the previously approved power uprate, and the applicable number of effective full power years (EFPYs) of the calculated fluence values. To complete the required information for the review, during the audit, the staff requested: (1) a reference for the calculations (2) clarification for the listed fluence values as to whether they include the power uprate and (3) clarification of the applicable EFPYs for the listed fluence values.

The applicant provided WCAP-16736-P Revision 1, May 2007. The staff asked the applicant to clarify inconsistencies between this reference and fluence values listed in Table 4.2.1-1 of the submittal. In RAI 4.2.1-04 the staff stated that Table 4.2.2-1 of the LRA shows a surface fluence of $3.2x10^{19}$ n/cm^2 (E > 1.0 MeV) for VEGP Unit 1 and $3.02x10^{19}$ n/cm^2 (E > 1.0 MeV) for VEGP Unit 2 whereas, Table 6.1.2-5 on page 6-12 of WCAP-16736 shows a surface fluence of $3.24x10^{19}$ n/cm^2 (E > 1.0 MeV) for VEGP Unit 1 and Table 6.1.2-7 on page 6-14 of WCAP-16736 shows a surface fluence of $3.06x10^{19}$ n/cm^2 (E > 1.0 MeV) for VEGP Unit 2. Do the fluences in Table 4.2.1-1 of the LRA which show surface fluences of $3.20x10^{19}$ n/cm^2 n/cm^2 (E > 1.0 MeV) for VEGP Unit 1 and $3.02x10^{19}$ n/cm^2 (E > 1.0 MeV) for VEGP Unit 2 include the 1.7% power uprate? Page 4.2-1 of the LRA appears to address the 1.7% MUR power uprate, however, it is not clear if this paragraph applies to Unit 1, Unit 2 or both.

In a letter dated February 27, 2008 the applicant stated that the values in Table 4.2.2-1 were calculated for the pre-MUR power level when the EOL would have been at 57 EFPYs. After the MUR implementation the corresponding EFPYs are 56.3. Therefore, the section 4.2.1 Tables are for 56.3 EFPYs while the WCAP-16736 values were calculated for 57 EFPYs. This is acceptable because the 56.3 EFPYs are still conservative with respect to the expected value of EFPYs. The licensee stated that the Section 4.2.1 Tables will be updated to reflect the MUR update fluence values.

Regarding the second question, the applicant stated that the values are applicable for both Units. The response reaffirmed the commitment to update the Tables in section 4.2.1 of the LRA to reflect the 57 EFPYs in the fluence values.

The applicant further stated that section 4.2-1 of the LRA discusses the fluence calculations based on the methodology in WCAP-14040-A Revision 4 that has been approved by the staff and adheres to the guidance in RG 1.190. The methodology has been benchmarked extensively to external measured values, such as the PCA (Pool Critical Assembly at ORNL) and to Vogtle 1 and 2 surveillance capsule results from the eight capsules removed and measured from both units.

The projected values (required by 54.21(c)(1)(ii)) are conservatively estimated to 57 EFPYs of operation at the current power level or 56.3 EFPYs at the MUR power level. Because the method adheres to guidance in RG 1.190, and the projected 57 EFPYs (and 56.3 EFPYs)are conservative the proposed fluence values are acceptable.

The fluence values were calculated at the peak inside surface beltline azimuthal locations for both units (45˚ and 30˚ azimuthal for Units 1 and 2 respectively) and the corresponding locations at the extended beltlines. All values were extended to ¼T and ¾T locations using the attenuation function in RG 1.99, Section 1.1, and Revision 2. Because the method adheres to RG 1.99 it is acceptable. Therefore, the staff concludes that the fluence values listed in Tables 4.2.1-1 and 4.2.1-2 of the submittal is acceptable.

4.2.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of neutron fluence analysis in LRA Section A.3.1.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address neutron fluence limits is adequate.

4.2.1.4 Conclusion

Section 4.2.1 of the submittal discusses the fluence calculation that was based on the methodology in WCAP-14040-A Revision 4, which has been approved by the staff and adheres to the guidance in RG 1.190. The methodology has been benchmarked extensively to external measured values, such as the PCA (Pool Critical Assembly at ORNL) and to Vogtle 1 and 2 surveillance capsule results from the eight capsules removed and measured from both units. The projected values (as required by 54.21(c)(1)(ii)) are conservatively estimated to 57 effective full power years (EFPYs) of operation at the current power level or 56.3 EFPYs when the planned measurement uncertainty recapture (MUR) becomes effective. Because the method adheres to guidance in RG 1.190, the projected EFPYs are conservative, and the method has been benchmarked as required it is acceptable.

Fluence values were calculated at the peak inside surface beltline azimuthal locations for both units (45˚ and 30˚ for Units 1 and 2 respectively) and the corresponding locations at the extended beltlines. All values were extended to ¼T and ¾T locations using the attenuation function in RG 1.99, Section 1.1, and Revision 2. Because the method adheres to RG 1.99 it is acceptable. Therefore, the staff concludes that the fluence values listed in Tables 4.2.1-1 and 4.2.1-2 of the submittal is acceptable.

On the basis of its review, as discussed above, the staff concludes that the fluence values listed in Tables 4.2.1-1 and 4.2.1-2 of the applicant's submittal is acceptable. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Upper Shelf Energy Analysis

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2 summarizes the evaluation of the upper shelf energy (USE) analysis for the period of extended operation. The applicant states that fracture toughness is a measure of a material's resistance to crack propagation. Charpy V-notch tests indirectly estimate fracture toughness, and Charpy V-notch test results are measured in ft.-lbs. of absorbed energy. The more ductile a material, the higher the fracture toughness and the more ft.-lbs. of energy will be absorbed during the Charpy V-notch test. The fracture toughness of RV steels is temperature-dependent. At low temperatures, the vessel material toughness is relatively low and constant and the material behaves in a brittle fashion. Rising temperatures reach a point where the toughness increases rapidly until another plateau where the toughness is relatively high and constant. In this high toughness region, the material is ductile. These regions of the curve are the lower shelf, transition zone, and upper shelf, respectively. The applicant notes that Title 10 of the Code of Federal Regulations (CFR) Part 50, Appendix G contains screening criteria that limit the degree that the USE value for a RV material may be allowed to drop due to neutron radiation exposure. The regulation requires the initial RV material USE to be equal to or above 75 ft.-lb. and for the USE to be equal to or above 50 ft.-lb. throughout the licensed life of the vessel, unless lower values of USE can be demonstrated to provide margins of safety against fracture equivalent to those required by the Appendix G of the American Society of Mechanical Engineers (ASME) Code, Section XI.

The applicant also states that an analysis of the USE of the VEGP's RV beltline materials for the license renewal period [56.3 effective full power years (EFPY)] requires the use of Regulatory Guide (RG) 1.99, Revision 2,"Radiation Embrittlement of Reactor Vessel Materials." The applicant further states that RV USE analyses were at the ¼T wall location of each beltline material using the respective copper contents and Figure 2 of the RG 1.99, Revision 2. The RV beltline material with the lowest predicted USE (61 ft.-lbs.) at 56.3 EFPY for VEGP, Unit 1 is Nozzle-to-Intermediate Shell Circumferential Weld 103-121 and the RV material with the lowest predicted USE (56 ft.-lbs.) at 56.3 EFPY for VEGP, Unit 2 is Shell Course Weld 105-121A. The projected USE values of these materials for the extended period of operation will remain above the required 50 ft-lb limit. This analysis demonstrates that, for the most limiting material in each RV, the lowest predicted USE is greater than the 10 CFR Part 50, Appendix G limit of 50 ft-lbs. The applicant states that, "Since all base materials and welds exceed the acceptance criteria of 10 CFR Part 50, Appendix G, these TLAA's have been shown to be acceptable in accordance with 10 CFR 54.21(c)(1)(ii)."

4.2.2.2 Staff Evaluation

The staff reviewed LRA Section 4.2.2 to verify pursuant to 10 CFR 54.21(c)(1)(ii) that the analysis has been projected to the end of the period of extended operation.

Section IV.A.1 to 10 CFR Part 50, Appendix G provides the Commission's requirements for demonstrating that RVs in U.S. light-water reactor facilities will have adequate protection from brittle failure throughout their service lives. The rule requires RV beltline materials to have USE values equal to or above 75 ft-lb when the materials are in the unirradiated condition and equal to or above 50 ft-lbs throughout the licensed life of the RV. RG 1.99, Revision 2 provides an expanded discussion regarding the calculations 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 Reactor Vessel Material Surveillance Program.

The applicant provided its USE analyses for the RV beltline materials of VEGP, Units 1 and 2 in Tables 4.2.2-1 and 4.2.2-2, respectively, of the LRA. The USE analyses were based on the ¼T neutron fluence values listed in LRA Tables 4.2.1-1 and 4.2.1-1 and these neutron fluence values were based on the projected values at the end of the extended period of operation. According to Table IV A-2 of NUREG-1801, Revision 1,"Generic Aging Lessons Learned Report," ferritic materials are subject to neutron embrittlement when they are exposed to a neutron fluence greater than 1 x 10^{17} n/cm^2 (E > 1 MeV) at the end of the extended period of operation.

The staff performed independent calculations of the USE values for the RV beltline materials through the expiration of the extended period of operation for VEGP, Units 1 and 2. The staff applied the ¼T neutron fluence values listed in LRA Table 4.2.1-1 for the VEGP, Unit 1 and 2 RVs as the basis for its independent calculations. The staff applied the methods provided in RG 1.99, Revision 2 for performing the independent USE calculations. The staff concludes that for VEGP, Unit 1 Nozzle-to-Intermediate Shell Plate Circumferential weld 103-21 is the limiting material and for VEGP, Unit 2 Shell Course Weld 105-121A is the limiting material. The staff calculated a USE value of 61 ft-lbs for the VEGP, Unit 1 weld at 0.0532x10^{19} n/cm^2 (E > 1.0 MeV) and this value is in good agreement with the USE value (i.e., 61 ft-lbs) calculated by the applicant for this weld. The staff calculated a USE value of 56 ft-lb for the VEGP, Unit 2 weld at 0.0455x10^{19} n/cm^2 (E > 1.0 MeV) and this value is in good agreement with the USE value (i.e., 56 ft-lbs) calculated by the applicant for this weld. Both of these values meet the acceptance criterion in 10 CFR Part 50, Appendix G for maintaining the USE values of the RV beltline materials above 50 ft-lbs throughout the licensed life of the plant. Therefore, since the bounding materials for the VEGP, Unit 1 and 2 RVs meet the requirements of 10 CFR Part 50, Appendix G, all of the VEGP, Unit 1 and 2 RV beltline materials meet the regulatory requirements.

Based on the technical assessments stated above, the staff concludes that the RVs at VEGP, Units 1 and 2 will maintain an acceptable level of USE values throughout the period of extended operation. The staff concludes that the applicant's TLAA for USE, as described in Section 4.2.2 of the LRA is in compliance with requirements of 10 CFR Part 50, Appendix G and, therefore, is acceptable.

4.2.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of upper shelf energy analysis in LRA Section A.3.1.2. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address upper shelf energy analysis is adequate.

4.2.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the USE analysis for VEGP, Units 1 and 2 has been projected to the end of the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Pressurized Thermal Shock

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 summarizes the evaluation of the unit's pressurized thermal shock (PTS) analysis for the period of extended operation. The applicant states that 10 CFR 50.61 defines screening criteria for the embrittlement of RV materials in pressurized water reactors (PWRs) as well as actions required if these screening criteria are exceeded. The RV reference temperature for PTS, RT_{PTS} , will increase due to increasing neutron fluence, and the screening criteria specify limits on the RT_{PTS} values. The rule requires the RT_{PTS} values for all beltline materials to be maintained below the PTS screening criteria throughout the extended period of operation. For circumferential welds, the PTS screening criterion is 300°F. For plates, forgings, and axial welds the PTS screening criterion is 270°F.

The applicant also states that it performed a PTS evaluation for the RV beltline materials in accordance with 10 CFR 50.61. Calculation of RT_{PTS} values is by addition of the initial RT_{NDT}, the predicted radiation-induced change in material properties (ΔRT_{NDT}), and a margin term (m) to account for uncertainties in the values of initial RT_{NDT}, copper and nickel contents, neutron fluence, and calculation procedures. Calculation of the predicted radiation-induced ΔRT_{NDT} is by use of the respective RV beltline material copper and nickel contents and the neutron fluence applicable to the RV material through 56.3 EFPY of operation.

Evaluations of the RT_{PTS} values for each RV beltline material were based on the tabulated chemistry factor values described in 10 CFR 50.61.

The applicant also states that RT_{PTS} values for the RV beltline materials at 56.3 EFPY were determined and the results of the PTS evaluation demonstrated that the RV beltline materials will not exceed the PTS screening criteria before the end of the period of extended operation. The controlling RV beltline material for VEGP, Unit 1 is Intermediate Shell Plate Heat Number B8805-2, with an RT_{PTS} value of 123°F at 56.3 EFPY, which is well below the PTS screening criterion of 270°F. The controlling RV beltline material for VEGP, Unit 2 is Nozzle Shell Course R3-3, with an RT_{PTS} value of 134°F at 56.3 EFPY, which is also well below the PTS screening criterion of 270°F. The applicant states that, "Since all base materials and welds meet the screening criteria contained in 10 CFR Part 50.61 at EOL, these TLAA's have been shown to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii)."

4.2.3.2 Staff Evaluation

The staff reviewed LRA Section 4.2.3 to verify, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis has been projected to the end of the period of extended operation.

10 CFR 50.61 provides the Commission's requirements for demonstrating that RVs in U.S. PWR facilities will have adequate protection against the consequences of PTS events throughout their licensed operating period. The rule requires licensees to calculate RT_{PTS} values for each base metal and weld material located in the beltline region of the RVs. The rule sets a screening limit of 270°F for RT_{PTS} values that are calculated for base metals (i.e., forging and plate materials) and axial weld materials and a screening limit of 300°F for RT_{PTS} values that are calculated for circumferential weld materials. The rule also provides an expanded discussion regarding how the calculations of RT_{PTS} values should be performed and describes two methods for determining RT_{PTS} values for RV beltline materials, depending on whether or not a given RV beltline material is represented in the plant's Reactor Vessel Material Surveillance Program.

The applicant provided its RT_{PTS} value assessments for the VEGP, Unit 1 and 2 RV beltline materials in Table 4.2.3-1 for VEGP, Unit 1 and Table 4.2.3-2 for VEGP, Unit 2 of the LRA. The RT_{PTS} values listed in these tables were based on the neutron fluence values at the clad-to-metal interface of the RV. According to Table IV A-2 of NUREG-1801, Revision 1, ferritic materials are subject to neutron embrittlement when they are exposed to a neutron fluence greater than 1×10^{17} n/cm^2 (E > 1 MeV) at the end of the extended period of operation. The applicant's neutron fluence values used to determine the RT_{PTS} values were based on the values that were projected to end of the extended period of operation. The applicant reported that for VEGP, Unit 1 Intermediate Shell Plate Heat Number B8805-2 is the limiting material for PTS with a RT_{PTS} value of 123°F. The applicant reported that for VEGP, Unit 2 Nozzle Shell Course R3-3 is the limiting material for PTS with a RT_{PTS} value of 134°F. These values were calculated using the chemistry factors obtained from the chemical composition of the limiting beltline material and the tables in 10 CFR 50.61.

To verify the validity of the applicant's calculation of the RT_{PTS} values for VEGP's limiting beltline materials, the staff performed independent calculations per 10 CFR 50.61 and found the RT_{PTS} values acceptable. The staff confirmed that Intermediate Shell Plate Heat Number B8805-2 and Nozzle Shell Course R3-3 were the limiting beltline materials for VEGP Units 1 and 2, respectively. The staff calculated an RT_{PTS} value of 123.3°F for VEGP, Unit 1 Intermediate Shell Plate Heat Number B8805-2 and an RT_{PTS} value of 134.2°F for VEGP, Unit 2 Nozzle Shell Course R3-3. The staff finds the RT_{PTS} values for all VEGP, Unit 1 and 2 RV beltline materials to be acceptable because the bounding materials comply with the requirements specified in 10 CFR 50.61.

Based on the technical assessments stated above, the staff concludes that the RV's at VEGP will maintain acceptable RT_{PTS} values throughout the period of extended operation. The staff therefore determined that the applicant's TLAA for PTS, as described in Section 4.2.3 of the LRA, is in compliance with the screening criteria specified in 10 CFR 50.61. Therefore, the staff concludes that the VEGP, Unit 1 and 2 RVs will be acceptable for PTS throughout the period of extended operation.

4.2.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of pressurized thermal shock analysis in LRA Section A.3.1.3. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address pressurized thermal shock analysis is adequate.

4.2.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the VEGP Units 1 and 2 RV PTS analysis has been projected to the end of the period of extended operation. The staff also determined 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 material adjusted reference temperature (ART) values for the period of extended operation. The applicant states that ART is the value is a material's Initial RT_{NDT} plus ΔRT_{NDT} plus margins for uncertainties at a specific location. Neutron embrittlement increases a material's ART value; thus, the minimum temperature at which an RV is allowed to be pressurized increases over the licensed period. The ART value of the limiting beltline material is used to correct the RV beltline P-T limits to account for radiation effects.

The applicant also states that calculation of ART values for the RV beltline region materials in accordance with RG 1.99, Revision 2 was performed by the addition of the initial RT_{NDT} to the predicted radiation-induced ΔRT_{NDT} and a margin term to account for uncertainties in the values of initial RT_{NDT}, copper and nickel contents, fluence, and the calculation procedures. Calculation of the predicted radiation-induced ΔRT_{NDT} was done by using the respective RV beltline material copper and nickel contents for, and the neutron fluence applicable to, a particular RV beltline material at 56.3 EFPY. The applicant further states that the evaluation for the ART values were performed at the ¼T and ¾T wall locations of each RV beltline material with chemistry factors determined from the tabulated values described in RG 1.99, Revision 2. In this manner, ART values for the RV beltline region materials applicable to 56.3 EFPY were determined. These results show that the RV limiting beltline materials at both ¼T and ¾T locations are Intermediate Shell Plate Heat Number B8805-2 for VEGP, Unit 1 and Lower Shell Plate R8-1 for VEGP, Unit 2. The applicant updated these calculations for EOL through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.2.4 to verify, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis of ART values has been projected to the end of the period of extended operation. The staff reviewed the ART values listed in Tables 4.2.3-1 and 4.2.3-2 of the LRA and performed independent calculations of the ART values for the RV beltline materials by using the method specified in RG 1.99, Revision 2. The ART values of the limiting beltline materials, Intermediate Shell Plate Heat Number B8805-2 for VEGP, Unit 1 and Lower Shell Plate R8-1 for VEGP, Unit 2, were verified per RG 1.99, Revision 2. The staff independently calculated ART values of 116.3°F and 101.3°F at the ¼T and ¾T locations for VEGP, Unit 1 Intermediate Shell Plate Heat Number B8805-2. The staff independently calculated ART values of 126.6°F and 112.5°F at the ¼T and ¾T locations for VEGP, Unit 2 Lower Shell Plate R8-1. The staff's calculations show that these materials were bounding for all VEGP, Units 1 and 2 RV beltline materials. The staff finds the ART values for these materials to be acceptable as they comply with the requirements of 10 CFR Part 50, Appendix G and the guidance of RG 1.99, Revision 2.

Based on the technical assessments stated above, the staff concludes that the ART values for the RV beltline materials, as projected through the period of extended operation are in conformance with the recommended guidelines of RG 1.99, Revision 2. Therefore, the staff concludes that the applicant's TLAA for the VEGP ART values is acceptable.

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.3.1.4. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address adjusted reference temperature analysis is adequate.

4.2.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis of RV beltline ART values has been projected to the end of the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 Pressure-Temperature Limits

4.2.5.1 Summary of Technical Information in the Application

LRA Section 4.2.5 summarizes the evaluation of operating pressure-temperature (P-T) limits for the period of extended operation. The applicant states that neutron embrittlement increases the ART; thus, the minimum temperature at which an RV is allowed to be pressurized increases over the licensed period. The ART value for the limiting beltline material is used to correct the beltline P-T limits to account for radiation effects. In accordance with 10 CFR Part 50, Appendix G, RV thermal limit analyses must determine operating P-T limits for boltup, hydrotest, pressure tests, normal operation, and anticipated operational occurrences. P-T operating limits are specifically required for three categories of operation: (1) hydrostatic pressure tests and leak tests, (2) non-nuclear heat-up/cool-down and low-level physics tests, and (3) core critical operation.
RV P-T limits and minimum temperature requirements in accordance with 10 CFR Part 50, Appendix G are defined by operating condition, vessel pressure, presence of fuel in the vessel, and core criticality. The P-T limits must be at least as conservative as limits

obtained by the methods of analysis and margins of safety of Appendix G of the ASME Code, Section XI. The minimum temperature requirements pertain to the limiting material, which is either the highly stressed material in the closure flange region or a material in the beltline region with the highest ART value.

The applicant also states that VEGP, Units 1 and 2 are currently operating to 36 EFPY P-T limit curves, which are included in the Pressure and Temperature Limits Report (PLTR) for each unit. As described in the PTLR, the Reactor Vessel Surveillance Program updates the P-T limit curves considering the data gained from capsules SNC pulls, and the content and update of the PTLR is in accordance with the VEGP Technical Specification 5.6.6. When the operating conditions of each unit merit the use of a different curve, the PTLR for that unit will be updated to include P-T limit curves that bound the current level of neutron embrittlement (i.e., EFPY) for the unit. Therefore, the applicant further states that this TLAA is in accordance with 10 CFR 54.21(c)(1)(ii) and 10 CFR 54.21(c)(1)(iii).

4.2.5.2 Staff Evaluation

The staff reviewed LRA Section 4.2.5, to verify pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis has been projected to the end of the period of extended operation.

Paragraph IV.A.2 of 10 CFR Part 50, Appendix G provides the staff's requirements and criteria for generating the P-T limits that are required for commercial U.S. light-water reactors. 10 CFR 50.36 requires licensees owning nuclear power production facilities to include the P-T limits and low pressure over-pressure protection (LTOP) system set points among the limiting conditions for operation (LCOs) in plant Technical Specifications (TS).

The staff, in a letter dated March 28, 2005, approved the current VEGP P-T limits which are valid for 36 EFPY. Revision of the P-T limits is based on the extent to which the beltline materials are exposed to the neutron fluence during the extended period of operation. Regarding the applicant's use of surveillance capsule test data, the LRA states, "As described in the PTLR, the Reactor Vessel Surveillance Program (Appendix B.3.25) updates the P-T limit curves considering the data gained from capsules SNC pulls, and the content and update of the PTLR is in accordance with the VEGP Technical Specification 5.6.6. When the operating conditions of each unit merit the use of a different curve, the PTLR for that unit is updated to include P-T limit curves that bound the current level of neutron embrittlement (i.e., EFPY) for the unit."

The staff finds the applicant's statement to manage the P-T limits acceptable because the change in P-T limits will be implemented in accordance with the facility's current licensing basis which meets the regulatory requirements of 10 CFR 50.60 and 10 CFR Part 50, Appendix G.

Based on the technical assessments stated above, the staff concludes that the applicant's TLAA for the pressure-temperature (P-T) limits are acceptable.

4.2.5.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the pressure temperature limits analysis in LRA Section A.3.1.5. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address pressure temperature limits analysis is adequate.

4.2.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii) and 10 CFR 54.21(c)(1)(iii), that the applicant's processes will adequately manage the VEGP, Units 1 and 2 P-T limit curves for the extended period of operation. In addition, the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) that the TLAA has been projected to the end of the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue

The VEGP design basis addresses the effects of metal fatigue. Fatigue is an age-related degradation mechanism caused by either mechanical or thermal cyclic stressing of a component. Fatigue analyses are TLAAs if they meet all six elements of the 10 CFR 54.3(a) definition. If the analyses are based on a number of cycles estimated for the current license term, they may meet criterion 54.3(a)(3) as based on the current operating term. If a component has a fatigue TLAA that remains valid for (demonstration in accordance with 10 CFR 54.21 (c)(1)(i)) or is projected to the end of (demonstration in accordance with 10 CFR 54.21 (c)(1)(ii)) the period of extended operation, cracking due to metal fatigue is not an aging effect requiring management for that component. If the fatigue TLAA cannot demonstrably remain valid for the period of extended operation by either of these methods, an aging management program (AMP) must manage the fatigue (demonstration in accordance with 10 CFR 54.21(c)(1)(iii)).

4.3.1 Fatigue of ASME Class 1 Components

The VEGP design incorporates the requirements of ASME Code Section III Class 1, which requires a discrete analysis of the thermal, mechanical, and dynamic stress cycles on reactor coolant pressure boundary components. The staff noted that although original design specifications commonly state that the transient conditions are for a 40-year design life, the fatigue analyses are based on the specified number of transient occurrences rather than on this lifetime. The applicant selected a design number for each transient somewhat larger than expected to occur during the 40-year licensed life of the plant based on operating experience and on projections of future operation based on system designs.

In addition to the original design transients, fatigue loading transients and issues subsequently identified are not parts of the original fatigue analyses. The staff noted that stratification and insurge-outsurge transients are evaluated for the lower pressurizer head and surge line, and the impact of the reactor coolant system (RCS) environment on the fatigue life of piping and components requires specific evaluation for license renewal.

4.3.1.1 Class 1 Piping and Component Design Transient Cycles

4.3.1.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1.1 summarizes the evaluation of Class 1 piping and component design transient cycles for the period of extended operation. UFSAR Table 3.9.N.1-1 summarizes the RCS design transients. LRA Table 4.3.1-1 lists these transients and indicates those under the Fatigue Monitoring Program. The applicant states that this program monitors transients and components to assure that actual plant experience remains bounded by design analyses assumptions. This program counts cycles of design-basis transient events and evaluates the number of occurrences against the design basis. LRA Table 4.3.1-1 indicates the basis for transients not monitored.

LRA Table 4.3.1-2 lists the component cyclic or transient limits that require monitoring as listed in UFSAR Table 3.9.N.1-2, including the design-basis cycles for each transient monitored, the number of cycles experienced as of October 9, 2005, and projected cycles based on current cycles to date to demonstrate that these transients will not exceed the design cycles in 60 years.

For the feedwater cycling, loss of charging flow (loop 1, loop 4), and loss of letdown and return to service transients, the CLB relies on cumulative usage factor (CUF) monitoring using stress-based fatigue monitoring of the limiting component locations (as indicated in the table). These component locations are the steam generator (SG) main and auxiliary feedwater nozzles and the normal and alternate charging nozzles. LRA Sections 4.3.1.2 and 4.3.1.3 describe and LRA Table 4.3.1-2 includes the evaluation of the projected CUF for the period of extended operation for these locations.

The CLB also relies on stress-based fatigue monitoring for the pressurizer surge line and lower pressurizer head due to thermal stratification issues. LRA Section 4.3.1.4 describes the evaluation of the projected CUF for the period of extended operation.

4.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.1, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation and, pursuant to 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 Table 4.3.1-2, Transients Tracked by Fatigue Monitoring Software, and noted that inadvertent safety injection transient has zero projected cycles. The staff concludes that having a zero projected cycle is not conservative and asked the applicant, during the audit and review, to confirm that the inadvertent safety injection transient is not used in any baseline fatigue. In its response, the applicant stated that SNC manually changed projections that software calculated as zero to one, but missed this particular cycle. The applicant also stated the projected number of inadvertent safety injections is not used in any baseline fatigue analysis. In a letter dated March 20, 2008, the applicant amended the LRA by changing the projected cycle for inadvertent safety injections to one. The staff noted the transient’s projected cycle does not affect the fatigue analysis. On this basis, the staff finds the applicant’s response acceptable.

4.3.1.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of metal fatigue in LRA Section A.3.2. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address metal fatigue analysis 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, pursuant to 10 CFR 54.21(c)(1)(i), that, for Class 1 piping and component design fatigue analysis, the analyses remain valid for the period of extended operation. The staff also determined 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 CUF Monitoring - SG Main and Auxiliary Feedwater Nozzles

4.3.1.2.1 Summary of Technical Information in the Application

LRA Section 4.3.1.2 summarizes the evaluation of CUF monitoring - SG main and auxiliary feedwater nozzles for the period of extended operation. Analysis of the SGs was in accordance with ASME Code Section III Class 1 requirements. The applicant states that in this analysis, one of the transients in the SG fatigue analysis was 2000 cycles of intermittent (slug) feeding of 32 °F feedwater into the SG at hot standby or no-load conditions. These 2000 cycles also include feedwater additions required during plant heatup and cooldown operations. Based on current operating experience, the analysis projects several SGs to exceed this number of cycles.

The applicant also states that rather than simple cycle counting of feedwater cycling events, VEGP uses stress-based fatigue monitoring of the SG main and auxiliary feedwater nozzles, the SG locations affected most by these events. The applicant determined from the fatigue analysis for these nozzles that the CUF with these increased cycles would remain well below 1.0. LRA Table 4.3.1-2 shows the calculated and 60-year projected CUFs for the main and auxiliary feedwater nozzles. The applicant further states that the Fatigue Monitoring Program will manage these nozzles by stress-based fatigue monitoring so the CUF remains below 1.0.

4.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.2, to verify pursuant to 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 noted that LRA Table 4.3.1-2, Transients Tracked by Fatigue Monitoring Software, did not indicate the start date for the transients tracked. During the audit and review, in an effort to clarify the transient cycles counted, the staff asked the applicant to clarify the start date of cycling counting. In its response, the applicant provided a table that contains the transient events documented in Table 4.3.1-2 along with the date of first recorded events for both units. The staff reviewed the applicant's response as well as the Westinghouse Report SE-ICAT(96)-212, which contained a detailed description of available plant records and the baseline count established at the time for each cycle counted. From its review, the staff noted software data for transient cycles has been generated since June 30, 1995, and that the cycles accrued prior to that date were properly documented. On this basis, the staff finds the applicant's response acceptable. The staff finds that the Fatigue Monitoring Program will adequately manage the fatigue usage of the steam generator main and auxiliary nozzles during the period of extended operation.

4.3.1.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of CUF monitoring - SG main and auxiliary feedwater nozzles in LRA Section A.3.2.1.

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address CUF monitoring - SG main and auxiliary feedwater nozzles 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, pursuant to 10 CFR 54.21(c)(1)(iii), that, for CUF monitoring - SG main and auxiliary feedwater nozzles, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also determined 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 CUF Monitoring - Charging Nozzles

4.3.1.3.1 Summary of Technical Information in the Application

LRA Section 4.3.1.3 summarizes the evaluation of CUF monitoring - charging nozzles for the period of extended operation. The applicant analyzed Class 1 portions of the charging and letdown systems for 20 cycles each of charging trip with prompt return and of letdown trip with delayed return. The applicant states that the projected cycles of these two transients are greater than design; however, the magnitudes of the transients and their resultant fatigue contribution are smaller than those in the design analyses.

The applicant also states that VEGP uses stress-based fatigue monitoring of the normal and alternate charging nozzles, the bounding locations in the Class 1 portion of the charging and letdown systems, rather than simple cycle counting of loss of charging, loss of letdown events, or both to maintain design limits for components affected by these cycles.

The applicant further states that it determined from fatigue analysis for these nozzles that the CUF with these increased cycles would remain well below 1.0. LRA Table 4.3.1-2 shows the calculated and 60-year projected CUFs for the charging nozzles, which the Fatigue Monitoring Program will manage by stress-based fatigue monitoring so the CUF remains below 1.0, the lowest established limit (LRA Section 4.3.1.7).

4.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.3, to verify pursuant to 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 LRA indicates that projected cycles of letdown trip with delayed return and charging trip with prompt return are greater than design. The LRA further stated that the magnitude of the transients and resultant fatigue contribution is smaller than in the design analysis. During the audit and review, the staff asked the applicant to explain how the magnitude of the transients and resultant fatigue is smaller than the design analysis and to provide all supporting documentation.

In its response, the applicant stated the temperature changes for actual events are less severe in magnitude and rate than the design transients. Furthermore, the applicant stated the increase in the number of cycles is small compared to the difference in severity between actual events and the design transients. The applicant concluded that since the actual temperature changes are less severe than the design transients and the increase in events is small, it follows that the actual CUF is less than the design CUF.

The staff reviewed the applicant's response as well as its supporting analysis reports, which define the severity of both transients and contain plots of actual transients. The staff noted the applicant uses stress-based monitoring, which include monitoring temperature changes instead of cycle counting. The staff confirmed that temperature changes are less in magnitude than that of design transients. Therefore, the staff agreed that applicant's statement is reasonable considering monitored transients data. On this basis, the staff finds the applicant's response acceptable.

4.3.1.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of CUF monitoring - charging nozzles in LRA Section A.3.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address CUF monitoring - charging nozzles 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, pursuant to 10 CFR 54.21(c)(1)(iii), that, for CUF monitoring - charging nozzles, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.4 Thermal Stratification of the Surge Line and Lower Pressurizer Head

4.3.1.4.1 Summary of Technical Information in the Application

LRA Section 4.3.1.4 summarizes the evaluation of thermal stratification of the surge line and lower pressurizer head for the period of extended operation. The applicant evaluated the impact of thermal stratification on the fatigue usage in the surge line in support of its response to NRC Bulletin 88-11. That evaluation found the surge line fatigue usage acceptable for 40 years of operation with thermal stratification effects due to insurge and outsurge from the pressurizer. For license renewal, the applicant states that the staff noted that the stress-based fatigue monitoring software module for the surge line calculates the actual CUF due to changes in temperature, pressure, and other parameters of surge line and lower pressurizer head fatigue and accounts for pressurizer insurge-outsurge and thermal stratification effects in both the lower pressurizer head and both surge line nozzles. The applicant also states that the highest 60-year projected CUF for these components is 0.06 for the Unit 2 hot leg surge nozzle; thus, the applicant addresses Westinghouse Commercial Atomic Power (WCAP)-14574A Renewal Applicant Action Item 3.3.1.1.-1 for license renewal by using the stress-based monitoring software for the pressurizer lower head and surge line nozzles and demonstrating that design limits are maintained throughout the period of extended operation. The applicant further states that the Fatigue Monitoring Program will manage the pressurizer lower head and surge line nozzles by stress-based fatigue monitoring so the CUF remains below 1.0, the lowest established limit (LRA Sections 4.3.1.5.3 and 4.3.1.6).

4.3.1.4.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.4, to verify pursuant to 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 section LRA Section 4.3.1.4 and noted that the LRA states that pressurizer lower head and surge line nozzle will be managed using stress-based fatigue monitoring by the Fatigue Monitoring Program. However, the applicant did not address the pressurizer lower head. In RAI 4.3-1, the staff asked the applicant to provide the limiting 60-year projected CUF value for the pressurizer lower head. In a letter dated February 21, 2008, the applicant provided the limiting 60-year projected CUF value, 0.00017, for the pressurizer lower head.

The staff noted that this value is lower than the ASME code limit of 1.0. On this basis, the staff finds the applicant’s response acceptable.

In addition, the staff reviewed an NRC safety evaluation entitled “Vogtle Unit 1 Safety Evaluation on Pressurizer Surge Line Thermal Stratification,” dated April 12, 1990. In this SER, the staff noted that it states:

> “Applicant committed to revise applicable operating procedures to limit the system delta T (between the pressurizer head and the reactor coolant loop) for reactor coolant system (RCS) heatup (HU) to 320ºF and RCS cool down (CD) to 300ºF.

The revised heatup and cooldown procedures ensure consistency between actual plant operation and the surge line analysis assumption."

In RAI 4.3-1, the staff also asked the applicant to discuss the procedures that have been used by VEGP. In addition, the staff asked the applicant to demonstrate the consistency between the recorded plant operational transient data and the assumptions that were made and used in the surge line and pressurizer lower head thermal stratification analyses.

In a letter dated February 21, 2008, the applicant provided the procedures numbers for cooldown to cold shutdown and heatup to hot shutdown. Both procedures, the applicant states, include a caution which calls for maintaining the Delta-T between the RCS and the pressurizer space as low as practical. In addition, both procedures state that the delta-T of 320 and 300 should not be exceeded for heatup and cool down, respectively. The applicant also provided the delta-T data from 1/1/97 through 2/18/08, which revealed that no delta-T for heatups and cooldowns reached 320 F and 300 F, respectively. In addition, the applicant states that in general, the maximum delta-T for each heatup and cooldown was in the 240 F and 260 F range. The staff reviewed applicant's response and noted that data available is within the limits, and therefore satisfies the commitment made by the applicant for the SER dated April 12, 1990. On this basis, the staff finds the applicant's response acceptable.

4.3.1.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of thermal stratification of the surge line and lower pressurizer head in LRA Section A.3.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address thermal stratification of the surge line and lower pressurizer head is adequate.

4.3.1.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for thermal stratification of the surge line and lower pressurizer head, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.5 Effects of Reactor Coolant System Environment on Fatigue Life of Piping and Components

4.3.1.5.1 Summary of Technical Information in the Application

LRA Section 4.3.1.5 summarizes the evaluation of effects of the RCS environment on fatigue life of piping and components for the period of extended operation. Generic Safety Issue 190 addressing fatigue life of metal components was closed in December 1999. In the closure letter, however, the NRC concluded that licensees should address the effects of reactor coolant environment on the fatigue life of selected components as they formulate AMPs in support of license renewal. The applicant stated that it evaluated these environmentally-assisted fatigue effects for plant-specific locations equivalent to those of NUREG/CR-6260 Section 5.4 for the newer vintage Westinghouse plant. These locations are reactor vessel shell and lower head, reactor vessel inlet and outlet nozzles, surge line hot leg nozzle, charging nozzle, and safety injection nozzle. The applicant also stated that it used formulas from NUREG/CR-5704 for stainless steel and from NUREG/CR-6583 for carbon and low-alloy steel components and showed the projected CUF values for these locations.

4.3.1.5.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.5, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation and, pursuant to 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.

LRA Section 4.3.1.5 states that cooldown/heatup cycles for Unit 1 and Unit 2 from June 30, 1995, through October 9, 2005, were analyzed to determine the average CUF. The staff noted this period is not the entire operating period of the plant, and asked the applicant to explain how this value was projected to the 60-year CUF during the audit and review.

In its response, the applicant stated that the transient projections are made using a weighting methodology that considers all cycles that have occurred but gives more weight to cycles that have occurred more recently than those that occurred in the past. The applicant provided the formula for calculating projections. In addition, the applicant stated the projected cycles of the transients and the resultant projected CUF are updated every 18 months so a future increase in frequency of a given transient will be quickly incorporated into a new projected number of cycles that gives more conservative values than a traditional straight line average projection.

The staff reviewed the applicant's response and reviewed a recent 18-month Vogtle fatigue monitoring report, which contain updates to VEGP cycle and CUF projections. The staff noted updating to the VEGP cycle and CUF projections with weighting methodology provide a realistic and current projection of transient-cycles. On this basis, the staff finds the applicant's response acceptable.

The staff reviewed the operating history of Vogtle and noted the plant implemented a modified operating procedure (MOP) to mitigate pressurizer insurge/outsurge transients. In RAI 4.3-2, the staff asked the applicant to discuss this MOP in detail and explain how the impacts of MOP were factored into the calculation of the average CUF per HU/CD in the EAF analysis.

In a letter dated February 21, 2008, the applicant provided its response to RAI 4.3-2, which includes the changes in plant procedures (heatup to hot shutdown, heatup to normal operating temperature and pressure, and cooldown to cold shutdown), findings of WCAP-14950, and adjustment the applicant will make to the CUF values for heater penetrations and surge nozzles.

The applicant stated that aspects of MOP were established at VEGP early in plant life. The applicant indicated that precautions were established in Rev. 0 of procedures (heatup to hot shutdown, heatup to normal operating temperature and pressure, and cooldown to cold shutdown) to establish limit in 1) boron concentration between the pressurizer and RCS and 2) delta -T between the RCS and pressurizer. In addition, the applicant indicated that another precaution was added to minimize the delta-T between the RCS hot leg and the pressurizer to address thermal stratification of the surge line.

The applicant provided overall strategies to mitigate insurge/outsurge transients in WCAP-14950, which includes 1) continuous pressurizer outsurge flow during heatup and cooldown operation and 2) minimizing the system delta-T. In addition, the applicant also provided CUF comparison between the standard steam bubble method and the modified steam bubble method documented in WCAP-14950. The WCAP report shows that for heater penetration and surge nozzle knuckle (bounding locations for pressurizer lower head and surge nozzle), the CUF was 1.84 and 1.88 times higher for the standard steam bubble method than the modified steam bubble method.

The applicant stated that VEGP now uses the modified steam bubble method, and that original procedures allowed either the standard or the modified steam bubble method. In addition, the applicant revised the 60-year CUF projection for heater penetration, surge nozzle, and hot leg surge nozzle by doubling the CUF values (that were calculated to account for transients that occurred from the first date of operation until 1/1/1998 for Unit 1 and 6/30/1995 for Unit 2) for these locations. In letters dated March 20, 2008 and June 27, 2008, the applicant amended its LRA by updating the CUF projection values for the locations mentioned.

The staff reviewed applicant's response and noted that applicant has implemented the WCAP strategies early in plant life. Thus, the staff finds that the applicant minimized the number of insurge and outsurge transients before the issuance of WCAP-14950 and the subsequent MOP.   In addition, the staff finds that by amending the LRA to account for higher CUF values due to standard steam bubble procedure that may be used prior to implementation of monitoring software, the new CUF values now accounted for the possible use of the standard bubble method. On these bases, the staff finds the applicant's response acceptable.

The staff reviewed LRA Sections 4.3.1.5.4 and 4.3.1.5.5 and noted values for the average F_{en} for charging nozzle and safety injection nozzles are provided in the LRA. During the audit and review, the applicant explained that F_{en} values for normal charging, alternative charging and safety injection nozzles were computed from the actual plant events using an integrated strain rate (ISR) method defined in an EPRI Report (TR-1003083, Guidelines for Assessing Fatigue Environmental Effects in a License Renewal Application.) The staff noted that the ISR method calculates one F_{en} value for one transient pair, though both the charging nozzle and the safety injection nozzle were designed to several thermal transients. In RAI 4.3-3, the staff asked the applicant to justify how one average F_{en} value per nozzle could be used for more than one transient pairs having significant contribution to the CUF.

In the February 21, 2008 letter, the applicant explained how F_{en} value was derived for the charging nozzle and safety injection nozzle. The applicant explained that for the charging nozzle, the available data were used to establish the F_{en} value for the period before monitoring began. Specifically, the applicant indicated that each transient event's ISR F_{en}

values were averaged to determine the F_{en} value for the unmonitored period for that specific transient event. Furthermore, the applicant indicated that the effective F_{en} for the charging nozzle was computed for the entire operating period. The applicant explained that for the safety injection nozzle, the F_{en} was calculated using the integrated strain rate method described in response to audit Question 4.3-05. In addition, the applicant stated that only safety injection events were used to calculate F_{en} while additional thermal and pressure transients (such as heatup and cooldown) do not cause measureable additional fatigue usage. The staff reviewed that applicant's response and noted that it explained the term, average F_{en}, provided in the LRA. In addition, the staff noted that average F_{en} is computed from all the transients accrued to date, and that individual transient event F_{en} value is calculated through the ISR method. On the basis that the applicant stated the term average F_{en}, the staff find the applicant's response acceptable.

The staff reviewed LRA Section 4.3.1.5 and noted it states that the environmentally-assisted fatigue on surge line hot leg nozzle, charging nozzle, and safety injection nozzle was evaluated using fatigue monitoring software. The staff concludes that the validity of fatigue monitoring software was not demonstrated by the applicant as no relevant benchmarking data is available to the staff. In RAI 4.3-4, the staff asked the applicant to provide the benchmarking of the software using relevant transient data, proper 3-D model (cylinder to cylinder), and ANSYS, the computer code acceptable for use. The staff also asked the applicant to justify the use of the fatigue monitoring software to update the CUF calculation by using the monitored or projected transient data (cycles) and to discuss the conservatisms in the calculation on a plant specific basis.

In the February 21, 2008 letter, the applicant provided its benchmarking results of the charging nozzle and surge line hot leg nozzle. The applicant provided its response to demonstrate the conservatisms of the software calculated results to a more refined ASME NB-3200 analysis for these two components. The response provides comparison of Max Salt, Max Sn, Max Ke, and CUF values for two transients per nozzle. The response showed that software analysis produce higher than ASME Analysis CUF values for all transients experienced by the nozzles. The staff reviewed this response, and identified several areas where additional information is needed before a determination of the adequacy and acceptability of the response can be made. Therefore, the staff issued RAI 4.3-5 to request this additional information. In a letter dated May 29, 2008, the applicant provided its response to RAI 4.3-5. In this letter, the applicant also committed to implement a fatigue management program that will use six stress components in the stress based fatigue calculation. On the basis that FatiguePro™ which only calculates 1-D virtual stress will not be used, but six stress components will be calculated, the staff finds the applicant's response acceptable.

4.3.1.5.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the effects of the RCS environment on fatigue life of piping and components in LRA Section A.3.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the effects of the RCS environment on fatigue life of piping and components is adequate.

4.3.1.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for effects of the RCS environment on fatigue life of piping and components, the analyses remain valid for the period of extended operation. The applicant also has demonstrated, pursuant to 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 also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.6 Full Structural Weld Overlays on Pressurizer Spray Nozzles, Safety and Relief Nozzles, and Surge Nozzles

4.3.1.6.1 Summary of Technical Information in the Application

LRA Section 4.3.1.6 summarizes the evaluation of full structural weld overlays on pressurizer spray nozzles, safety and relief nozzles, and surge nozzles for the period of extended operation.

The applicant has installed full structural weld overlays on the Unit 2 pressurizer spray nozzle, pressurizer safety and relief nozzles, and the pressurizer surge nozzle and plans to install them on the corresponding Unit 1 components at the next refueling outage.

The applicant states that fatigue crack growth analyses using ASME Code Section XI methodology demonstrated the fatigue qualification at the structural weld overlay regions. The impact of the addition of structural weld overlay material on the existing primary stress qualification, considering both deadweight and dynamic loadings, was insignificant. The applicant also states that reconciliation of the existing fatigue evaluation for the limiting locations outside the full structural weld overlays demonstrated that the pressurizer nozzles still would meet ASME Code Section III requirements. The transient assumptions for this analysis are consistent with the existing stress analyses and the Fatigue Monitoring Program.

This change does not affect the cycle counting or cycle-based fatigue modules of the Fatigue Monitoring Program; however, evaluation of the effects of the weld overlays on the program’s stress-based module for monitoring the CUF of the pressurizer nozzles continues. As an enhancement to the program, prior to the period of extended operation the applicant states it will evaluate the impact of the full structural weld overlays on the stress-based fatigue modules for the pressurizer nozzles and, if the existing module is not conservative, revise it to continue to provide valid results. The 60-year projection of the CUF for the limiting surge nozzle location, using the existing stress-based fatigue module, is 0.00004.

4.3.1.6.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.6, pursuant to 10 CFR 54.21(c)(1).

The staff noted that the applicant did not specify whether the TLAA full structural weld overlays on pressurizer spray nozzles, safety, and relief nozzles and surge nozzle were demonstrated to be acceptable in accordance to 10 CFR 54.21(c)1(i), 10 CFR 54.21 (c)1(ii), or 10 CFR 54.21 (c)1(iii). Therefore, the staff asked the applicant to provide clarification as well as to provide a summary of this TLAA during the audit.

In its response, the applicant stated that it will amend the VEGP LRA to include the following information at the end of Section 4.3.1.6:

> In summary, the reconciliation of the existing fatigue evaluation that was performed for the limiting locations outside the FSWOL is a TLAA that remains valid for the period of extended operation because the cycles assumed will not be exceeded during 60 years of operation. Therefore, this TLAA has been demonstrated to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

In a letter dated March 20, 2008, the applicant amended the application according to the response above. The staff reviewed the change and noted that the proper code of federal regulation is cited in the LRA. On this basis, the staff finds the applicant's response acceptable.

4.3.1.6.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of full structural weld overlays on pressurizer spray nozzles, safety and relief nozzles, and surge nozzle in LRA Section A.3.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address full structural weld overlays on pressurizer spray nozzles, safety and relief nozzles, and surge nozzle is adequate.

4.3.1.6.4 Conclusion

On the basis of its review as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for full structural weld overlays on pressurizer spray nozzles, safety and relief nozzles, and surge nozzle remain valid for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.7 High-Energy Line-Break Postulated Locations Based on Fatigue Cumulative Usage Factor

4.3.1.7.1 Summary of Technical Information in the Application

LRA Section 4.3.1.7 summarizes the evaluation of high-energy line-break postulated locations based on fatigue CUF for the period of extended operation. Postulation criteria for high-energy line breaks described in UFSAR Section 3.6.2.1.1 are from Branch Technical Position MEB 3-1 except for lines with postulated breaks eliminated by leak-before-break analysis. One of the MEB 3-1 criteria for Class 1 piping postulates pipe breaks at any intermediate locations where the CUF exceeds 0.1. The applicant states that the staff has determined that this postulation qualifies as a TLAA.

The applicant also states that the original 40-year design cycles are conservative for 60 years of operation except for the feedwater cycling transient and the loss of charging and loss of letdown transients; therefore, the CLB postulated intermediate break locations are unaffected except possibly the Class 1 piping by these transients.

For the feedwater cycling transient, the only Class 1 components analyzed are the SGs. The transient impacted SG main and auxiliary feedwater nozzles but the attached piping is not Class 1; therefore, the postulation of intermediate break points in the feedwater and auxiliary feedwater systems is unaffected.

The applicant further states that for the charging line and letdown line transients, CUF monitoring of the charging nozzles assures that all Class 1 chemical volume and control system components continue to have a CUF less than 1.0; however, without more this assurance does not necessarily lead to the conclusion that the CUF of Class 1 chemical volume and control system components with a design CUF less than 0.1 will remain below 0.1. For the period of extended operation, the 0.01316 reduced allowable CUF for the charging nozzle accommodates environmental fatigue effects (LRA Section 4.3.1.5.4) for assurance that the CUF for Class 1 charging and letdown line components with a design CUF less than 0.1 will remain below 0.1.

Prior to the period of extended operation, the applicant states it will ensure that the Fatigue Monitoring Program limits adequately maintain below 0.1 the CUF for Class 1 portions of the charging and letdown lines with a design analysis CUF of less than 0.1 consistent with the CLB for postulated intermediate break locations.

4.3.1.7.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.7, pursuant to 10 CFR 54.21(c)(1).

The staff reviewed the application, and noted that it is not clear whether the TLAA "High Energy Line-Break Postulated Locations Based on fatigue Cumulative Usage Factor" is demonstrated to be acceptable in accordance to 10 CFR 54.21(c)(i), 10 CFR 54.21 (c)(ii), or 10 CFR 54.21 (c)(iii). Therefore, the staff asked the applicant to provide clarification as well as to provide a summary of this TLAA during the audit.

In its response, the applicant stated that after the VEGP LRA was submitted, Westinghouse performed the additional review mentioned in the LRA. The applicant stated that, in accordance with Westinghouse letter GP-18223, the applicant concluded that CUFs at nozzles are higher than those at the adjacent piping components and that if the usage factor calculated for the nozzle subjected to operating transients is less than the design usage factor, it may be concluded that the adjacent class 1 auxiliary piping components' usage factors would be less than their design usage factors if evaluated for the same operating transients. Furthermore, the applicant stated it will amend the VEGP LRA to replace the last two paragraphs of Section 4.3.1.7 with the following information:

> The normal and alternate charging nozzle design usage factors are 0.995. The maximum usage factors in the piping are 0.90 in Section 1, and 0.40 in Section 2. Based on the system design and operation, the actual operating transients in the piping and nozzles will be similar, consistent with the design transients. Therefore, it is reasonable to conclude that fatigue usage factors calculated for the RCL charging nozzles based on operating transients are bounding for the locations in the adjacent class 1 auxiliary piping. It is also reasonable to conclude that the magnitudes of fatigue usage of the various components will be related in a manner similar to those reported in the design reports.
>
> Therefore, if the usage factor calculated for the nozzle subjected to operating transients is less than the design usage factor, it may be concluded that the adjacent class 1 auxiliary piping components' usage factors would be less than their design usage factors if evaluated for the same operating transients. Therefore, the existing HELB analyses for CVCS piping remain valid as long as the Fatigue Monitoring Program maintains the CUF of the charging nozzles less than or equal to 1.0 (see Section 4.3.1.5.4).
>
> In summary, the existing VEGP HELB analyses have been shown to remain valid for the period of extended operation, except for the VEGP HELB analysis for CVCS piping which is maintained valid by the Fatigue Monitoring Program.
>
> Therefore, this TLAA has been demonstrated to be acceptable for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii).

In a letter dated March 20, 2008, the applicant amended its application according to the response above. The staff reviewed this amendment as well as the response above and noted that 10 CFR 54.21(c)(1)(i) and 10 CFR 54.21(c)(1)(iii) are the applicable regulations cited in the LRA. On this basis, the staff finds the applicant response acceptable.

4.3.1.7.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of high-energy line-break postulated locations based on fatigue cumulative usage factor in LRA Section A.3.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address high-energy line-break postulated locations based on fatigue cumulative usage factor is adequate.

4.3.1.7.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses for high-energy line-break postulated locations based on fatigue CUF remain valid for the period of extended operation. The applicant has also demonstrated pursuant to10 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 also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 Fatigue of ASME Non-Class 1 Components

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2 summarizes the evaluation of fatigue of ASME Code non-Class 1 components for the period of extended operation. The applicant states that in the license renewal evaluation of cracking due to thermal fatigue for ASME Code components outside the reactor coolant pressure boundary (non-Class 1), thermal stresses on piping bound thermal stresses on other system components. The design of ASME Code Section III Classes 2 and 3 piping systems incorporates stress-reduction factors for determining the acceptability of the piping design for thermal stresses. Components within the scope of license renewal designed to ASME B31.1 requirements also incorporate stress-reduction factors based upon an assumed number of thermal expansion cycles. In general, the calculation of the thermal expansion stress (S_A) assumes 7000 full-temperature thermal cycles leading to a stress reduction factor of 1.0 in the stress analyses.

The applicant states it also evaluated the validity of the assumption of 7000 full-temperature thermal cycles for 60 years of plant operation. The assumption was generally conservative and the actual temperature changes experienced by most systems were much less severe than the design full-temperature cycles.

In some cases, the evaluation converted "partial-cycle" transients with an actual temperature change much less severe than that of the design full-temperature cycles to equivalent full-temperature thermal cycles (or, conversely, converted full-temperature cycles to an allowable number of partial-temperature cycles).

The applicant notes that ANSI B31.1 Power Piping Code, 1967 Edition, Section 102.3.2, provides the following equation and methodology for mathematical determination of the number of equivalent full-temperature range changes that result from the number of lesser temperature range changes:

$$N = N_E + r_1^5 N_1 + r_2^5 N_2 + \ldots r_n^5 N_n$$

Where: N = the number of equivalent full-temperature cycles,

N_E = number of cycles at full temperature change for which expansion stress has been calculated,

$N_1, N_2 \ldots N_n$ = number of cycles at lesser temperature changes,

$r_1, r_2 \ldots r_n$ = ratio of lesser temperature cycles to the cycle for which the expansion stress has been calculated.

The results of this evaluation indicate that the 7000 full-temperature thermal cycle assumptions is valid and bounding for 60 years of operation. Therefore, the applicant further states that existing fatigue analyses for the non-ASME Code Class 1 components are valid for the extended term of operation.

4.3.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2 to verify, that pursuant to 10 CFR 54.21(c)(1)(i), the analyses remain valid for the period of extended operation.

The staff reviewed LRA Section 4.3.2 and noted that the LRA states “In general, the assumption was conservative and the actual temperature changes experienced by most systems were less severe than the design full-temperature cycles.” The staff noted that the LRA did not provide the plant systems which experienced temperature changes greater than those assumed in the initial design and asked the applicant for the list during the audit. The staff also asked the applicant to explain how these plant systems were evaluated. In its response, the applicant stated that no plant systems were identified that experienced temperature changes greater than those assumed in the initial design. Furthermore, the applicant intends to provide clarification to the LRA by removing the words “in general.” In a letter dated March 20, 2008, the applicant amended its LRA with the response above. The staff reviewed the response as well as the amendment and noted that clarification was provided by the applicant. On this basis, the staff finds the applicant’s response acceptable.

The staff reviewed LRA Section 4.3.2 and noted that the LRA describes evaluations, which converted “partial-cycle” transients with an actual temperature changes to equivalent full-temperature thermal cycles (or conversely, converted full-temperature cycles to an allowable number of partial-temperature cycles). During the audit and review, the staff asked the applicant to identify which systems were evaluated using “partial cycles” and to discuss how the expansion stress range for the partial cycles is evaluated. In its response, the applicant provided a list of systems evaluated by assuming an actual temperature change and determining how many of those “partial cycles” would result in the same thermal expansion stress as 7000 full-temperature cycles using design temperature changes. Furthermore, the applicant will clarify the application by removing the following text “or, conversely, converted full-temperature cycles to an allowable number of partial-temperature cycles.” In the March 20, 2008 letter, the applicant submitted an amendment to the LRA according to its response above.

The staff reviewed the applicant’s response as well as the calculation that SNC performed for evaluations of partial cycles and noted that clarification was provided by the applicant. On this basis, the staff finds the applicant’s response acceptable.

During the audit and review, the staff reviewed the basis document, VEGP-LR-TLAA-307, and noted that it states that the fatigue analysis related to letdown heat exchanger, containment coil and MSIV are determined as TLAA. The staff noted these TLAAs are not discussed in the LRA. Therefore, the staff asked the applicant to provide the details of these TLAA.

In its response, the applicant stated it will add the following paragraphs to the end of LRA Section 4.3.2:

> There are non-Class 1 fatigue evaluations that use a different method of analysis than the 7000 cycles described above. In general, those evaluations use the same cycles, or a subset of the cycles, used for the Class 1 piping and therefore the existing analysis remains valid for 60 years because the cycles assumed will not be exceeded in 60 years.
>
> One case is the analysis that addresses fatigue of the letdown heat exchangers. That analysis utilizes some of the primary piping transient events. The calculation demonstrates that a fatigue exemption applies to the heat exchanger and shows the damage factor for the heat exchanger bolting to be satisfactory with the ring spacer. The cycles assumed for both the heat exchanger and the bolting are bounded by the Class 1 piping cycles. Therefore, this analysis is determined to be a TLAA, but the analysis is already valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
>
> Another case is the fatigue test report for containment cooler Copper-Nickel Alloy Cooling Coils. This test report evaluates, by experiment, the stress placed upon Cu-Ni coils due to 1500 thermal cycles over a 40-year design life. The transient cycles that most apply to the cooling coils are those of plant start-up and shutdown (when the containment experiences the greatest temperature change). The limits for RCS start-up and Shutdown (200 of both) will limit the cycles that the coolers see to much less than 1500 for 60 years. Therefore, this analysis is determined to be a TLAA, but the analysis is already valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).
>
> Another case is the fatigue analysis of the main steam isolation valves that uses the maximum number of cycles in specification AX4AR17 (2000 for 40 years). The calculation shows that for the maximum yoke stress as calculated, 10000 cycles are allowed. This is 5 times the minimum acceptable per the spec. The component fatigue is bounded by the piping fatigue, which is assured through limits on the number of piping cycles in the Fatigue Monitoring Program. Therefore, this analysis is determined to be a TLAA, but the analysis is already valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

In the March 20, 2008 letter, the applicant amended the LRA as stated above. The staff found that all three TLAAs have been described in sufficient technical detail. On this basis, the staff finds the applicant's response acceptable.

4.3.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fatigue of ASME non-Class 1 components in LRA Section A.3.2.2. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of ASME non-Class 1 components is adequate.

4.3.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for fatigue of ASME non-Class 1 components, the analyses remain valid for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Fatigue of the Reactor Coolant Pump Flywheel

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3 summarizes the evaluation of fatigue of the reactor coolant pump flywheel for the period of extended operation. A calculation for the reactor coolant pump flywheels assumes that each pump will be subjected to 6000 start-stop cycles over a 60-year life. The Fatigue Monitoring Program limits each reactor coolant pump to 1000 start-stop cycles, and 60-year projections indicate 632 pump starts at the end of the period of extended operation. Therefore, the applicant determined that the 6000 start-stop cycles remain bounding for 60 years of operation and the fatigue evaluation of the reactor coolant pump flywheels is demonstrably valid for the period of extended operation.

4.3.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.3 to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff reviewed LRA Section 4.3.3 and noted the 60-year projections for each reactor coolant pump is within the limit set by the Fatigue Monitoring Program.

The staff reviewed the calculations on the reactor coolant pump and confirmed the applicant’s statement. On this basis, the staff finds the applicant’s cycle projection acceptable.

4.3.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fatigue of the reactor coolant pump flywheel in LRA Section A.3.2.3. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address fatigue of the reactor coolant pump flywheel is adequate.

4.3.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for fatigue of the reactor coolant pump flywheel, the analyses remain valid for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.4 Fatigue of Reactor Vessel Supports

4.3.4.1 Summary of Technical Information in the Application

LRA Section 4.3.4 summarizes the evaluation of fatigue of reactor vessel supports for the period of extended operation. The Westinghouse Generic Technical Report WCAP 14422, Revision 2a, considers fatigue of reactor vessel supports a potential TLAA for supports constructed in accordance with the 1963 version of the American Institute of Steel Construction (AISC) Code. The applicant states that In the SER for this WCAP report, staff indicates that license renewal applicant must ensure a later AISC Code version was used. If not, the applicant should address the issues related to the aging effect from fatigue. The applicant further states that the VEGP design used the AISC Code 1969 version and, therefore, the existing analysis is demonstrably valid for the period of extended operation.

4.3.4.2 Staff Evaluation

The staff reviewed LRA Section 4.3.4 to verify, pursuant to 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 reviewed the basis documents for metal fatigue time-limited aging analyses, VEGP-LR-TLAA-307 and VEGP-LR-TE-018. The staff noted that the applicant's basis documents state that an LRA amendment is required to correct the LRA statement on the design basis of reactor vessel support. The staff asked the applicant to confirm the amendment will revise LRA section 4.3.4 from "Code of Record for VEGP as AISC 1969 version" to "ASME Code Section III. NF in accordance with UFSAR Table 3.2.2-1."

In its response, the applicant stated that the reactor pressure vessel supports embedded within the primary shield are procured in accordance with ASME Code, Section III, Division 1, Subsection NF; however, since they are outside the ASME Jurisdictional boundary, their design follows AISC specifications. Furthermore, the applicant stated both the 1969 version of the AISC Code and ASME Code, Section III, Division 1, Subsection NF apply to the supports.

In a letter dated March 20, 2008, the applicant revised the LRA to reflect that both codes apply to reactor pressure vessel supports. The staff reviewed the applicant's response and its amendment change, and noted that the reactor pressure vessel supports were designed to an AISC code version later than the AISC 1963 code. On this basis, the staff finds the applicant's response applicable because it is consistent with the SER for WCAP 14422, Revision 2a.

4.3.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fatigue of reactor vessel supports in LRA Section A.3.2.4. 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 reactor vessel supports is adequate.

4.3.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for fatigue of reactor vessel supports, the analyses remain valid for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 Fatigue of Steam Generator Secondary Manway and Handhole Bolts

4.3.5.1 Summary of Technical Information in the Application

LRA Section 4.3.5 summarizes the evaluation of fatigue of SG secondary manway and handhole bolts for the period of extended operation. The applicant states that a Westinghouse calculation for SG secondary manway and handhole bolts assumed the same transients as those for Class 1 component fatigue evaluations and found a qualified life for the manway bolts of only 20 years. In 1993, there was a determination that a low-temperature rerate would reduce the qualified life of the manway bolts to 14.5 years. The applicant also states that a new secondary side manway and handhole bolts fatigue evaluation based on revised cycles applicable to 40 years of operation qualified the bolts for the current operating period with rerating. The 40-year CUF based on revised cycles for 40 years with rerate is 0.997 for secondary side manway bolts and 0.724 for the handhole bolts. The applicant elected to replace secondary manway and handhole bolts at 30 years of service life in lieu of fatigue monitoring.

The applicant further states that it will continue to ensure that the bolt design limit is not exceeded during the period of extended operation by periodically replacing both secondary side manway and handhole bolts under the Bolting Integrity Program, to manage fatigue. The manway bolts have not been replaced previously and are scheduled for replacement at 30 years of service life during the 2017 and 2019 spring outages for Units 1 and 2, respectively. The handhole bolts were replaced in 1996 and 1998 for Units 1 and 2, respectively, and are scheduled to be replaced again during the 2026 and 2028 spring outages for Units 1 and 2, respectively; therefore, the Bolting Integrity Program adequately manages SG secondary manway and handhole bolt fatigue for the period of extended operation.

4.3.5.2 Staff Evaluation

The staff reviewed LRA Section 4.3.5, to verify pursuant to 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 noted the applicant proposed to periodically replace secondary manway and handhole bolts at 30 years of service life in its application. This information contradicts the Vogtle License Renewal Commitment List, which states that this replacement schedule may be changed due to an updated analyses initiated by the Bolting Integrity Program. During the audit, the staff asked the applicant to explain why 10 CFR 54.21(c)(1)(iii) is used if these bolts' replacement schedule is dependent on future analyses.

In its response, the applicant indicated there is currently no plan to perform an analysis under the Bolting Integrity Program that could be used to change the scheduled replacement of steam generator manway and handhole bolts. Furthermore, the applicant stated that, should SNC decide at a later date to revise the replacement schedule of these bolts, an analysis would be performed to justify the revision.

The staff reviewed the applicant's response, and noted the replacement schedule for steam generator manway and handhole bolts is based on a potential replacement schedule. The staff also noted that this potential is still part of the Bolting Integrity Program. Therefore, these bolts are still managed under the Bolting Integrity Program and 10 CFR 54.21(c)(1)(iii) still applies. On this basis, the staff finds the applicant's response acceptable. In addition, the staff noted that the applicant amended Commitment # 30 (on replacement schedule for steam generator manway and handhold bots) to reflect the above change. The staff reviewed the change and noted that Commitment # 30 is now consistent with the applicant response and therefore acceptable.

4.3.5.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fatigue of SG secondary manway and handhole bolts in LRA Section A.3.2.5. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of SG secondary manway and handhole bolts is adequate.

4.3.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for fatigue of SG secondary manway and handhole bolts, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.6 Fatigue of Reactor Vessel Internals

4.3.6.1 Summary of Technical Information in the Application

LRA Section 4.3.6 summarizes the evaluation of fatigue of reactor vessel internals for the period of extended operation. The applicant states that the original design did not require a fatigue analysis of the reactor vessel internals; however, for rerating, a Westinghouse calculation for reactor vessel internals that assumed the same cycles as those for Class 1 component fatigue evaluations found CUFs less than 1.0 for all subcomponents evaluated. As the analysis utilized the same design transients as those for the Class 1 component evaluations, the evaluation of the ASME Class 1 piping and component design transient cycles applies also to the reactor vessel internals.

The applicant further states that the design cycles for the transients applicable to the reactor vessel internals were conservative, therefore; the reactor vessel fatigue evaluation remains valid for the period of extended operation.

4.3.6.2 Staff Evaluation

The staff reviewed LRA Section 4.3.6 to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff reviewed the LRA Section 4.3.6 and noted that the LRA states the design cycles for the transient applicable to the reactor vessel internals were shown to be conservative. During the audit and review, the staff asked the applicant to justify why the current design cycles for reactor vessel internals is conservative considering some of the transients are projected to exceed design cycles.

In its response, the applicant stated that:

> The only events that are projected to exceed design cycles at VEGP are feedwater cycling, letdown trip delayed and charging trip prompt. Feedwater cycling event provides a negligible contribution to the fatigue of the reactor vessel internals. The other two events are auxiliary transients and they are not considered in the fatigue evaluation of the reactor vessel.

The staff reviewed the applicant's response and noted that the only applicable transient that is projected to exceed the design cycle is the feedwater cycling transient that provides only a negligible contribution to the fatigue of the reactor vessel internals. The staff reviewed the LRA and noted all other transient cycles are within their design limits, and therefore the design cycles for the transients applicable to the reactor vessel internals can be considered conservative. On this basis, the staff finds the applicant's response acceptable.

4.3.6.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fatigue of reactor vessel internals in LRA Section A.3.2.6. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue of reactor vessel internals is adequate.

4.3.6.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for fatigue of reactor vessel internals, the analyses remain valid for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 <u>Environmental Qualification of Equipment</u>

The 10 CFR 50.49 EQ program is a TLAA for purposes of license renewal. The TLAA of the EQ electrical components includes all long-lived, passive, and active electrical and I&C 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.

As required by 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 environmental qualification (EQ) of equipment for the period of extended operation. Section 50.49 and Appendix A of 10 CFR Part 50 establish EQ requirements. The applicant established its EQ program to demonstrate that certain electrical components are qualified to perform safety functions in the harsh environment following a design-basis accident. Elements of the proof of qualification involve the original 40-year license period; hence, EQ Program qualification reports and calculations meet the TLAA definition. In general, the applicant did not establish for EQ Program components qualified lives longer than the original 40-year license period.

EQ of mechanical equipment is through stringent selection of materials for use under adverse environmental conditions supported by partial type testing and material analysis and evaluation to confirm the adequacy of the materials.

As a result of this application, there will be no components added to the EQ Program. Qualified EQ component service lives already determined are tracked to determine when a component nears the end of its service life. For components nearing the end the EQ Program re-evaluates them for longer service refurbished or requalified or for replacement. The EQ Program is procedurally in compliance with 10 CFR Part 50, Appendix B, and routinely audited for quality assurance. This program will be continued through the period of extended operation; hence, the TLAAs will be managed by an AMP in accordance with 10 CFR 54.21(c)(1)(iii).

The program discussion addressees the EQ component reanalysis attributes (analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective action).

4.4.2 Staff Evaluation

The staff reviewed LRA Section 4.4, to verify pursuant to 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 4.4 and the program basis document to determine whether the applicant had submitted adequate information to meet the requirement of 10 CFR 54.21(c)(1). For the electrical equipment identified in LRA Table 4.1-1, the applicant used 10 CFR 54.21(c)(1)(iii) to demonstrate that the aging effects of EQ equipment will be adequately managed during the period of extended operation. The staff reviewed the Environmental Qualification Program to determine whether it will ensure that the electrical and I&C components covered under 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 Program manages the aging effects to meet the requirements delineated in 10 CFR 50.49.

The staff conducted an audit of the information provided in LRA Section B.3.37 and program bases documents. The staff's evaluation is documented in SER Section 3.0.3.1.8. On the basis of its audit, the staff finds that the Environmental Qualification Program, which the applicant claimed to be consistent with the GALL AMP X.E1, "Environment Qualification of Electrical Components," is consistent with the GALL Report.

Therefore, the staff finds that the program is capable of programmatically managing the qualified life of components within the scope of the program for license renewal.

4.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of environmental qualification of equipment in LRA Section A.3.3. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address environmental qualification of equipment is adequate.

4.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for environmental qualification of equipment, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also determined 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

4.5.1 Summary of Technical Information in the Application

In VEGP LRA Section 4.5, the applicant summarizes the evaluation of concrete containment tendon prestress for the period of extended operation. The containment structure consists of a prestressed reinforced concrete cylinder and hemispherical dome.

Containment prestressing is by a two-way post-tensioning system consisting of circumferential hoop tendons and two groups of inverted U-shaped tendons. The prestressing tendons in prestressed concrete containments lose their prestressing forces with time due to creep and shrinkage of the concrete and relaxation of the prestressing steel. Loss of tendon prestressing force is a TLAA; therefore, the adequacy of the prestressing forces is evaluated for the period of extended operation.

The applicant states that as part of tendon surveillance, under the IWL Inservice Inspection Program, a sample of tendons from each group (inverted U-shaped and hoop) in each inspection interval is inspected to ensure that the acceptance criteria are met and tendon prestressing force will remain above minimum required values for the succeeding inspection interval. The program also recalculates the regression analysis trend lines of these two tendon groups from individual tendon forces consistent with Information Notice 99-10 (*i.e.*, using individual tendon data rather than averages) to verify if the average prestressing force in each tendon group will remain above their minimum required values for the remainder of the licensed operating period.

The applicant also states that extended to 60 years, the regression analysis demonstrated that prestress in both the inverted U-shaped and horizontal ("hoop") tendon groups should remain above the applicable minimum required values for at least 60 years of operation and that all tendons, therefore, should maintain their design-basis function for the period of extended operation without retensioning. Similarly, no individual tendon data from the "common tendons" (one inverted U-shaped and one horizontal with prestress measured at each surveillance) or from the other sample tendons tested to date show a loss of prestress sufficient to indicate a possible need to retension during the extended period of operation.

The applicant further states that consistent with 10 CFR 54.21(c) (1) Option (ii), acceptable prestress forces in containment tendons have been projected to the end of the period of extended operation.

4.5.2 Staff Evaluation

The staff reviewed LRA Section 4.5 according to the requirements of 10 CFR 54.21(c)(1)(ii) to verify that (1) the trend of prestressing forces in each tendon group has been projected to the end of the period of extended operation and (2) the projected prestressing forces are above their respective minimum required values. The following discussion describes the staff's RAI related to the LRA Section 4.5, the corresponding applicant responses, and the staff evaluation.

In Figure 4.5-4a, "Unit 2 Vertical Baseline Tendon V20-92", and Figure 4.5-5a, "Unit 2 Shell Hoop Baseline Tendon H-99", of the LRA the tendon force in the seventh year is larger than that in the third year. By letter dated January 28, 2008, the staff issued RAI 4.5-1 to request the applicant to discuss this anomaly and determine its effect on the regression analysis and the corresponding trend lines.

By letter dated February 27, 2008, the applicant responded to RAI 4.5-1 and stated that the reason that the tendon force in the seventh year is larger than that in the third year can be attributed to the method of lift-off measurement performed by two different vendors for the third and seventh year. The applicant further investigated the trend lines ignoring 3rd year data and then ignoring 7th year data only and in both cases 60 year trend line values were greater than the minimum required prestressing force values.

The staff finds the applicant's response to RAI 4.5-1 acceptable because further investigation of the trend lines showed that the 60 year trend line prestressing forces will still be greater than the minimum required values.

In a subsequent telephone conference as summarized in a letter from D. J. Ashley (NRC) to Southern Nuclear Operating Company dated March 26, 2008, the staff noted that all figures depicting the tendon lift-off force trend lines in Section 4.5 are based on years after the initial Structural Integrity Test (SIT) which may not coincide with the years after the initial date of operation. As such, the staff requested the applicant to reconcile the difference between the initial SIT and the initial date of operation.

The applicant stated that the difference between the initial SIT and the initial date of operation is approximately 4 months for each unit at VEGP and the effects of this 4 months difference on the results of the regression analysis shown in Section 4.5 of the LRA will be insignificant.

Because of the logarithmic scale of time in Figures included in Section 4.5 and margins available between the 60 year trend values and the minimum required values of prestressing shown in Table 4.5-7 of the LRA, the staff concurs that 4 month difference will not affect the trend line significantly and the prestress in the inverted U-shaped and hoop tendon groups will remain above the applicable minimum required values for 60 years of operation. The staff recognizes that because of subsequent containment tendon surveillance lift-off results the trend line presently shown in Section 4.5 of the LRA could change. The staff accepts the applicant's assertion that this attribute will be managed by the containment in-service inspection program which entails taking appropriate corrective actions should the projected tendon force for a tendon group fall below the minimum required value.

4.5.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of concrete containment tendon prestress in LRA Section A.3.4. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address concrete containment tendon prestress is adequate.

4.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(ii) ,that for the TLAA for concrete containment prestressing tendons, the effects of aging on the intended function(s) have been projected to the end of the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA on containment tendon loss of prestress analysis for the period of extended operation, as required by 10 CFR 54.21(d).

4.6 <u>Penetration Load Cycles</u>

4.6.1 Summary of Technical Information in the Application

LRA Section 4.6 summarizes the evaluation of penetration load cycles for the period of extended operation. Fatigue evaluations were required for some of the containment penetrations and for analyses qualifying as TLAAs. The applicant compared the transient assumptions for those evaluations against the transient assumptions for Class 1 component fatigue and determined that the penetration fatigue evaluations are adequate and require no updating for license renewal.

The number of transients assumed for the penetrations is bounded by the number of transients assumed for Class 1 piping. Per LRA Section 4.3.1, the 40-year design cycles are maintained as the 60-year design cycles except that the applicant credits CUF monitoring of the main and auxiliary feedwater nozzles rather than monitoring of feedwater cycling events and credits CUF monitoring of the charging nozzles rather than monitoring of loss of charging and loss of letdown events.

The penetration fatigue calculations do not assume the number of feedwater cycles. Only one penetration fatigue calculation considers the number of loss of charging or loss of letdown events in calculating CUF, and the applicant has determined that none of the cycles assumed in that fatigue evaluation will be exceeded within the period of extended operation.

4.6.2 Staff Evaluation

The staff reviewed LRA Section 4.6 to verify pursuant to 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 reviewed the applicant's specification "Specification for Pipe Penetrations for Georgia Power Company Alvin W. Vogtle Nuclear Plant Burke County, Georgia," November 12, 1987, (X4AQ10, Rev.7) to identify the transient assumptions used for the fatigue evaluation of the penetrations. The staff's review of the transient assumptions showed that all of them were bounded by the VEGP USFAR Table 3.9.N.1-1 transients, except for Penetrations 1, 2, 3, 4, 7, 8, 9, 10, 11A, 11B, 12B, & 12C, the applicant assumed 2000 feedwater cycles and for Penetration 4, the applicant assumed loss of charging and loss of letdown. Since the transient assumptions for all the penetrations, except those listed above, were bounded by the cycle limits assumed in the Fatigue Monitoring Program, the existing analyses remain valid for those penetrations.

The staff noted that the fatigue evaluation AX4AQ10-129-1, dated September 26, 1986, calculated the fatigue at a number of nodes. While the alternating stress intensity and the associated temperature was different for each, the cycles used/allowed and the calculated fatigue usage was the same for all transients. Specifically, for each node, two event pairs evaluated were some combination of steady state at 290, a ramp up to 430, a ramp down to 290, and steady state at 290.

In each case, the fatigue calculation for each event pair was:

Cycles used/allowed = 185,680/1,000,000 = 0.18568 (Partial Usage)

Adding the calculated partial usage for each event pair resulted in the cumulative fatigue usage (CUF) for each node evaluated is 0.37136.

Therefore, it can be seen that the fatigue calculation assumed a total of 185,680 cycles, 880 of which are attributable to the loss of charging/loss of letdown events. The resulting CUF is 0.37136. Doubling the assumed number of loss of charging/loss of letdown events to 400 would increase the number in the calculation from 880 of 185,680 to 1760 of 186,560 and increase the calculated CUF to:

186,560/1,000,000 = 0.18656 (Partial Usage for first event pair)

186,560/1,000,000 = 0.18656 (partial Usage for second event pair)

Or 0.37312 (Total CUF)

For the penetrations that assumed 2000 feedwater cycles, the transient is considered in determining if a fatigue calculation is required and the resulting stresses are used in the calculation for determining the allowed cycles. However, the resulting temperature cycles are only 31.5 ºF, which results in a multiplication factor of 0 and the effective number of ΔT cycles of 0. On the above basis, the staff finds, that penetration fatigue calculation also remains valid through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The staff finds it acceptable because the feedwater containment penetrations are not subject to a temperature range that would be high enough to induce thermal stresses in the components.

4.6.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of penetration load cycles in LRA Section A.3.5. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address penetration load cycles is adequate.

4.6.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for penetration load cycles, the analyses remain valid for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Plant Specific Analysis

4.7.1 Leak-Before-Break Analysis

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1 summarizes the evaluation of leak-before-break (LBB) analysis for the period of extended operation. UFSAR Section 3.6.1 summarizes plant-specific LBB analyses for both units. These analyses technically justify the elimination of postulated breaks in the reactor coolant loop piping (except for the Unit 1 accumulator and residual heat removal (RHR) branch connections) and pressurizer surge line from the structural design basis.

The applicant states that the analyses for those LBB applications were performed by Westinghouse and the applicant's submittals were accepted by NRC staff. NUREG-1137, the Safety Evaluation Report for VEGP, evaluated the reactor coolant loop analysis (WCAP-10551) and incorporated it into the original final safety analysis report. Through NUREG-1137 Supplement 7 issued in January 1988, the staff accepted the methodology and the results of WCAP-11531, -11583, and -11589 submitted for review.

The aging effect addressed in these evaluations is cracking, specifically in LBB crack stability evaluations for enveloping critical locations determined from loading, pipe geometry, and fracture toughness considerations. A fatigue crack growth analysis also demonstrated negligible fatigue crack growth. Assumptions in these analyses with potential bases in the original 40-year term of operation are the fracture toughness properties for cast austenitic stainless steel (CASS) materials (due to thermal aging) and the design transients cumulative cycles.

The applicant also states that its TLAA evaluation of the primary loop analyses determined that no updates of the pressurizer surge line and Unit 2 RHR line LBB analyses were required for license renewal as these have no CASS materials and as the transients assumed for 40 years are bounding for 60 years (LRA Section 4.3). The applicant determined that the reactor coolant loop and the Unit 2 accumulator line analyses should be updated to account for the extended term because CASS materials are present.

The applicant further states that at its request Westinghouse created an addendum to WCAP-10551 analyzing the reactor coolant loop to account for the addition of thermal aging of the CASS materials for the period of extended operation. In December 2005 Westinghouse issued Addendum 1, a Westinghouse proprietary Class 2 document, accounting for the effects of thermal aging degradation of the CASS materials over 60 years of operation. Using faulted loads, the analysis demonstrates a margin of at least 2 between the critical flaw and the flaw with a leak rate of 10 gallons per minute (the detectable leakage flow) and a margin of 10 between the calculated leak rate from the detectable leakage locations and the stable detectable leakage flow. The 1.4 margin on loads required by action Item 10 of the final safety evaluation report for WCAP-14575-A is satisfied. No CASS material for Unit 1 and 2 primary loop piping having been replaced. The second part of action Item 10 does not apply.

At the applicant's request Westinghouse created an addendum to WCAP-11583 analyzing the Unit 2 accumulator line to account for the addition of thermal aging of the CASS materials for the period of extended operation and in July 2006 issued Addendum 1, a Westinghouse Proprietary Class 2 document accounting for the effects of thermal aging degradation of the CASS materials over 60 years of operation. The applicant states that using faulted loads; the analysis demonstrates a margin of at least 2 between the critical flaw and the flaw having a leak rate of 10 gallons per minute (the detectable leakage flow) and a margin of 10 between the calculated leak rate from the detectable leakage locations and the stable detectable leakage flow. The 1.4 margin on loads required by action Item 10 of the final safety evaluation report for WCAP-14575-A is satisfied. No CASS material for the Unit 2 accumulator line having been replaced, the second part of action Item 10 does not apply.

The applicant determined that the evaluations for the Unit 2 RHR line and pressurizer surge line were acceptable for the extended license term. The evaluations for the primary coolant loops and the Unit 2 accumulator line were evaluated and updated to address operation through 60 years.

4.7.1.2 Staff Evaluation

The staff reviewed LRA Section 4.7.1, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation and, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The staff noted that LBB analyses should address material susceptibility to corrosion, the potential for high residual stresses, and environmental conditions that could lead to degradation by stress corrosion cracking considering 60 years of extended operation. Specifically, Standard Review Plan (SRP) Section 3.6.3 states that primary water stress corrosion (PWSCC) is considered to be an active degradation mechanism in alloy 600/82/182 materials in pressurized water reactor plants.

During the audit, the applicant stated that the alloy 600/82/182 materials within the scope of these analyses are the Alloy 82/182 welds on the primary loop piping and at the pressurizer surge line connection to the pressurizer nozzle. In addition, the applicant stated that as a part of the license renewal program, WCAP-10551-P, Addendum 1, performed a LBB evaluation for the Units 1 and 2 primary loop piping that explicitly addressed the PWSCC concern for the Alloy 82/182 welds in this piping.

For the Alloy 82/182 welds in the pressurizer surge line, the applicant states Full-Structural Weld Overlays (FSWOL) are being implemented under the existing 10 CFR 50 processes using Alloy 52/152 weld material, eliminating reliance on the Alloy 82/182 welds to mitigate the PWSCC concern.

In a letter dated March 20, 2008, the applicant stated SNC will verify the LBB evaluation in WCAP-10551-p, Addendum 1 meets the conditions of that process or have it re-performed using the acceptable process.

The staff reviewed the applicant’s response as well as its Commitment No. 36, and noted that the applicant is committed to address the PWSCC implication on the current LBB analysis in accordance with the future guidance the staff will develop prior to the period of extended operation. On this basis, the staff finds the applicant’s response and its LRA amendment acceptable.

The staff reviewed section 4.7.1 of the LRA and noted that it states “For license renewal, SNC performed a TLAA evaluation of the primary loop analyses: SNC determined that no updates of the pressurizer surge line and Unit 2 RHR line LBB analyses were required for license renewal.” During the audit and review, the staff reviewed SNC letter NL-06-2768 dated January 3, 2007, that contained a request for NRC approval of a proposed alternative for application of pressurizer nozzle FWSOL on VEGP Unit 2. The staff noted that in this letter the applicant stated that the original leak-before-break (LBB) analyses will be confirmed to be valid after the weld overlays are applied, the amount of shrinkage is determined, and the shrinkage is determined, and the shrinkage stresses are calculated. During the audit and review, the staff noted that it is not clear whether the LBB analyses is to be updated or whether updating analyses will affect the validity of FSOWL during the period of extended operation and asked the applicant to clarify.

In its response, the applicant stated that the existing LBB reports were reviewed and determined to remain valid for the period of extended operation because the surge line contains no CASS material and the transient assumptions used in the fatigue portion of that evaluation remain valid for 60 years operation. In addition, the applicant pointed out that the implementation of the FSWOLs is accomplished under the existing 10 CFR 50 process, which meant that the period of extended operation will not impact the validity of the LBB analyses performed for the FSWOL effort.

The staff reviewed the applicant’s response and noted that review of LBB analyses has been completed and determined to remain valid for the period of extended operation by Westinghouse. On this basis, the staff finds the applicant’s response acceptable.

4.7.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of leak-before-break analysis in LRA Section A.3.6.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address leak-before-break analysis is adequate.

4.7.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for leak-before-break analysis, the analyses remain valid for the period of extended operation. The applicant also has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Fuel Oil Storage Tank Corrosion Allowance

4.7.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2 summarizes the evaluation of fuel oil storage tank corrosion allowance for the period of extended operation. UFSAR Section 9.5.4.2.1.1 states that the diesel fuel oil storage tanks, with no cathodic protection, have a liberal corrosion allowance of 1/8 inch. The applicant discussed the fuel oil storage tank corrosion allowance with the staff. The response to SER Open Item 10 for the UFSAR proves that there is sufficient corrosion allowance in the buried fuel oil storage tanks and piping for an assumed failure size in the coatings of the equipment. The response uses 40 years as the duration for the corrosion allowance. A substitution of 60 years into the calculations indicates that the corrosion allowance should not be exceeded during the period of extended operation of the plant. In this case, the soils analysis shows that the piping will not be affected adversely by corrosion (from the outside into the tank).

For the period of extended operation, the Buried Piping and Tanks Aging Management Program will manage loss of material due to corrosion on the tank exterior (exposed to soil).

The Buried Piping and Tanks Aging Management Program addresses the aging effect of corrosion for these components demonstrably in accordance with 10 CFR 54.21(c)(1)(iii).

4.7.2.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2, to verify pursuant to 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.

10 CFR 54.21(c)(1) allows for TLAAs to be accepted in accordance with one of the following three options for TLAA acceptance:

(i) the analysis remains acceptable for the period of extended operation

(ii) the analysis has been projected through the expiration of the period of extended operation

(iii) the effects of aging on the intended function(s) will be managed for the period of extended operation

The applicant stated that the effects of corrosion on the intended structural integrity function of the fuel oil storage tank will be managed for the period of extended operation in accordance with the provisions of 10 CFR 54.21(c)(1)(iii), and credited AMP B.3.4, Buried Piping and Tanks Inspection Program as the program for managing loss of material or cracking due to corrosion in the fuel oil storage tank pressure retaining walls.

The staff reviewed the applicant’s license renewal basis evaluation document for the fuel oil storage tank corrosion allowance analysis to determine which VEGP document or record contained the corrosion allowance analysis for the fuel oil storage tank and to verify that analysis was an analysis that met the six criteria of a TLAA, as defined in 10 CFR 54.3. The staff also reviewed the program attributes for the LRA AMP B.3.4, Buried Piping and Tanks Aging Management Program, as provided in the license renewal basis evaluation document for the AMP, to determine whether this AMP was a valid AMP to credit for aging management under the acceptance criterion of 10 CFR 54.21(c)(1)(iii) and whether the AMP would be capable of managing any loss of material or cracking that may occur in the pressure retaining walls of the tanks prior to a loss of intended function.

The staff concludes that neither the UFSAR for VEGP nor the license renewal basis evaluation document identified the VEGP record that contained the corrosion allowance analysis for the fuel oil storage tank. The staff asked the applicant to: (1) identify which VEGP record specifically contained the corrosion analysis for the fuel oil storage tanks, (2) clarify why the analysis meets the criteria for a TLAA as defined in 10 CFR 54.3, and (3) to clarify what the time parameter and what the acceptance criterion are for this analysis.

The applicant responded to the staff's question in a letter dated February 8, 2008. In its response, the applicant stated that the corrosion allowance evaluation for the fuel oil storage tanks was docketed in a letter to the NRC dated October 2, 1985, and that this evaluation was docketed to resolve Open Item 10 that was issued as part of the NRC's original current licensing basis criteria for the VEGP units, as documented in NUREG 1137, Supplement 1, "Safety Evaluation Report Related to the Operation of Votgle Electric Generating Plant, Units 1 and 2 [October 1985]." The applicant also stated that this analysis meets all criteria for a TLAA in 10 CFR 54.3 and that the number of remaining plant years, as projected through 60 years of licensed plant operations, was the time parameter for the analysis, and that the analysis allows for 1/8 inch corrosion through the tank wall thickness. This is equivalent to the additional thickness of the corrosion allowance protection that was incorporated into the tanks nominal wall thickness design when the tanks were fabricated. The staff finds the applicant's response to be acceptable because it clarified what the CLB documents and parameters are for the fuel oil storage tank corrosion analysis.

The staff reviewed the fuel oil storage tank corrosion allowance analysis (identified as "SER Open Item 10: Cathodic Protection of Fuel Oil Tanks" in the VEGP letter and report of October 2, 1985) and determined the analysis assessed the remaining amount of corrosion allowance that was incorporated into the design wall thickness of the fuel oil storage tanks and their associated piping. The staff concludes that the analysis used a galvanic voltage and current-based evaluation to assess and quantify the amount of galvanically-induced corrosion that could potentially penetrate into the corrosion allowance for the fuel oil storage tanks and their associated fuel oil delivery piping over a 40-year licensed operational plant life. The staff concludes that the report assumes that galvanically-induced corrosion could penetrate entirely through the entire thickness of the additional corrosion allowance for the fuel oil storage tanks and associated piping, but sets a limit that no galvanically-induced corrosion can penetrate into the nominal design wall thicknesses for these components. The amount of corrosion allowance is 0.00318 m (1/8 inch) for the fuel oil storage tanks and 0.00159 m (1/16 inch) for the associated piping. Table 4.7.2-1 summarizes the results of the analysis:

Table 4.7.2-1: Summary of the Corrosion Allowance Analysis for the Diesel Fuel Oil Storage Tanks and Associated Fuel Oil Delivery Piping

Component	Corrosion Allowance Thickness [1]	Result's of VEGP's 40-Year Licensed Analysis in the CLB (in % Penetration of Allowable Corrosion Allowance Thickness)	Staff's Independent 60-Year Projected Analysis [2] (in % Penetration of Allowable Corrosion Allowance Thickness)	Acceptability Determination [3] (Acceptable: [Yes/No] / Acceptance Criterion
Fuel Oil Storage Tanks	0.00318 meters (1/8 inch)	25%	37.6%	Yes : 10 CFR 54.21(c)(1)(ii)
Associated Fuel Oil Delivery Piping	0.00159 meters (1/16 inch)	50 %	75.5%	Yes : 10 CFR 54.21(c)(1)(ii)

Notes:

1. The report assumes that the entire corrosion allowance can be penetrated (i.e. 100% allowable penetration by galvanic corrosion), but that the penetration cannot extend into the nominal design wall thickness. The report also assumes that the flaw is a 1/32 inch diameter circular pit (flaw) that induces an oxidation cell below the protective coating. The numbers in this column represent the amount of additional corrosion allowance thickness that was incorporated into the component design.
2. The applicant did not include any 60-year year projection of the analysis in the LRA but rather opted to manage the aging effect for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii). The staff did an independent 60-year calculation of the remaining corrosion allowance based on the applicant's galvanic corrosion methodology to check whether there would be acceptable corrosion allowance even if the applicant did not manage that aging effect for the period of extended operation. The applicant provided its updated 60-year corrosion allowance projections in the applicant's letter of March 20, 2008.
3. The analysis is acceptable in accordance with the provisions of 10 CFR 54.21(c)(1)(ii) if the projected 60-year depth of penetration is less than 100 %, as based on the staff's independent calculation. Alternatively, the applicant may accept this TLAA in accordance with 10 CFR 54.21(c)(1)(iii) if it demonstrates that the effects of galvanic corrosion on the intended structural integrity function of the fuel oil storage tanks and associated delivery piping will be managed for the period of extended operation.

Footnote 3. in Table 4.7.2-1 provides the basis for accepting this TLAA in accordance with the provision in 10 CFR 54.21(c)(1)(ii). The results of the staff's independent 60-year projection of the corrosion allowance demonstrates that the fuel oil storage tanks will have 72.4% remaining margin on the corrosion allowance that was incorporated into the tank design and that the associated fuel oil delivery piping will have a 24.5% remaining margin on the corrosion allowance that was incorporated into the pipe design. This is in addition to the margins of safety for the fuel oil storage tanks and delivery piping that are required by the design specifications.

The staff noted that AMR items 20m (piping) and 33c (fuel oil tanks) in LRA Table 3.3.2-20 identify that the external surfaces of the fuel oil storage tanks and their associated piping are exposed to a buried soil environment. The staff also noted that, rather than assess whether the original corrosion allowance analysis would remain valid or be acceptable as projected through the expiration of the period of extended operation, the applicant has opted to use 10 CFR 54.21(c)(1)(iii) as the basis for accepting this TLAA and to credit the

Buried Piping and Tanks Inspection Program as the AMP for managing loss of material and/or cracking due to corrosion in the tank's wall thickness. The staff informed the applicant that the Buried Piping and Tanks Inspection Program was not, by itself, n valid AMP to credit because the AMP did not necessarily guarantee that the external surfaces of the fuel oil storage tanks would be inspected either by an opportunistic bare metal examination or by an supplemental bare metal examination that would be scheduled for the period of extended operation. The staff also informed the applicant that it would either need to: (1) demonstrate that the existing corrosion allowance analysis remains valid for the period of extended operation in accordance with the requirement of 10 CFR 54.21(c)(1)(i), or (2) demonstrate that the corrosion allowance analysis has been projected to through the expiration of the period of extended operation in accordance with the requirement of 10 CFR 54.21(c)(1)(ii), or else (3) demonstrate that the aging effect's impact on the intended function of the fuel oil storage tanks would be managed during the period of extended operation in accordance with the requirement of 10 CFR 54.21(c)(1)(iii). The staff asked to applicant to provide its basis why the Buried Piping and Tanks Inspection Program could be credited in accordance with 10 CFR 54.21(c)(1)(iii) if the program could not ensure that the outside surfaces of the fuel oil storage tanks would be excavated and inspected for evidence of corrosion.

The applicant provided its response to the staff question in a letter dated February 2, 2008. In its response, the applicant stated that, instead or crediting the Buried Piping and Tanks Inspection Program for aging management of corrosion in the diesel fuel oil storage tank, the applicant would amend the application for state that the corrosion allowance analysis for the diesel fuel oil storage tank has been projected to and has been found acceptable in accordance with the staff's requirement in 10 CFR 54.21(c)(1)(ii).

The applicant also stated that, as a conservative measure, the applicant would also continue to credit its Buried Piping and Tanks Inspection Program to manage the impacts of loss of material due galvanic corrosion on the structural integrity of the fuel oil storage tanks. The applicant also stated that LRA Section 4.7.2 and A.3.6.2 would be amended accordingly.

The staff confirmed that, in the applicant's letter of March 20, 2008, the applicant amended the LRA to provide its basis for accepting this TLAA in accordance with 10 CFR 54.21(c)(1)(ii). In this letter, the applicant indicated that the depth of corrosion penetration into the corrosion allowance for the tanks is projected to increase from a 40-year value of 25% penetration to a 60-year value of 51% penetration. The staff noted that the applicant's projected 60-year penetration value for the tanks (51%) is more conservative than the staff's independent 60-year projection of 37.6% penetration into the corrosion allowance for the tanks and meets the acceptance criterion of 100% full penetration into the corrosion allowance for the tanks. Based on this review the staff finds that the applicant has provided an acceptable basis that demonstrates that the projected depth of corrosion penetration into the tanks would be acceptable for the period of extended operation and that the corrosion allowance analysis for the tanks is acceptable in accordance with requirements of 10 CFR 54.21(c)(1)(ii). The applicant's letter of March 20, 2008 also indicated that, as a conservative measure, the applicant would continue to credit its Buried Piping and Tanks Inspection Program to manage the aging effect of loss of material in the diesel fuel oil storage tanks.

The staff also confirmed that, in the applicant's letter of March 20, 2008, the applicant also provided the updated depth of penetration analysis for the diesel fuel storage tank delivery piping. In this analysis, the applicant indicated that the depth of corrosion penetration into the corrosion allowance for the piping is projected to increase from a 40-year value of 50% penetration to a 60-year value of 76% penetration. The staff noted that the applicant's projected 60-year penetration value (76%) for the piping is consistent with the staff's independent 60-year projection of 75.5% penetration into the corrosion allowance for the piping and meets the acceptance criterion of 100% full penetration into the corrosion allowance for the piping. Based on this review, the staff finds that the applicant has provided an acceptable basis that demonstrates that the projected depth of corrosion penetration into the diesel fuel oil tank delivery piping would be acceptable for the period of extended operation and that the corrosion allowance analysis for the piping is acceptable in accordance with requirements of 10 CFR 54.21(c)(1)(ii).

Based on this review, the staff concludes that the applicant has provided an acceptable basis for accepting the corrosion analyses for the diesel fuel oil storage tanks and diesel fuel oil delivery piping in accordance with the requirements of 10 CFR 54.21(c)(1)(ii)

4.7.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of fuel oil storage tank corrosion allowance in LRA Section A.3.6.2. The staff noted that the applicant has opted to manage the effects of corrosion on the intended function of the fuel oil storage tanks and associated fuel oil piping using both the Buried Piping and Tanks Inspection Program and the One-Time Inspection Program. The staff verified that, in the applicant's letter of March 20, 2008, the applicant amended the LRA to provides its basis for accepting the corrosion allowance analyses for the diesel fuel oil storage tanks and diesel fuel oil delivery piping in accordance with 10 CFR 54.21(c)(1)(ii), and updated LRA UFSAR Supplement section A.3.6.2 to indicate the following:

> The VEGP Diesel Fuel Oil Storage Tanks and associated piping are not provided with cathodic protection; therefore, a liberal corrosion allowance was included. A calculation performed to evaluate the corrosion allowance included a 40-year assumption and has been determined to be a TLAA.
>
> The calculation determined the depth of penetration for a hole of approximately 1/32" diameter (0.001 in2) in the coating. The calculation was reviewed for license renewal, and it was determined that depth of penetration due to corrosion would not exceed the corrosion allowance during a 60-year operating life.
>
> Specifically, consideration of 60 years instead of 40 years in the calculation increases the depth of penetration due to corrosion from 25% to 51% of the corrosion allowance for the tanks and from 50% to 76% of the corrosion allowance for the pipes. Therefore, demonstration is in accordance with 10 CFR 54.21 (c)(1)(ii).

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address fuel oil storage tank corrosion allowance is adequate because the applicant has updated the UFSAR supplement summary description to provide the applicant’s basis for accepting the diesel fuel storage tank and delivery piping corrosion analyses in accordance with the requirements of 10 CFR 54.21(c)(1)(ii).

4.7.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that, for fuel oil storage tank corrosion allowance, the corrosion analyses for the diesel fuel oil storage tanks and diesel fuel oil delivery piping have been projected to the end of period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3 Steam Generator Tube, Loss of Material

4.7.3.1 Summary of Technical Information in the Application

LRA Section 4.7.3 summarizes the evaluation of loss of SG tube material for the period of extended operation. UFSAR Section 5.4.2 describes allowances for erosion and corrosion partially based upon a measured rate of loss of material for 40 years. The allowance for erosion and corrosion is much less than the allowed loss of material in the Steam Generator Program. The addition of 50 percent to the loss of material allowances to account for 60 years of operation has no significant effect upon the analysis.

The nominal tube wall thickness is 0.040”. The Steam Generator Program – Tube Integrity requires that SG tubes be plugged if they have a 40-percent degradation (0.040*.4 = 0.016 or a wall thickness less than 0.024”) from the nominal wall thickness. Results of the specific analysis for allowable tube wall thinning for the Model F SG tubes under normal operating and accident loadings indicate a minimum wall thickness of 0.014" to satisfy Regulatory Guide 1.121 stress limits.

The minimum inspection-acceptable wall thickness for new tubes is 0.039”. Assumed general wall loss due to corrosion and erosion over 40 years is 3 mils, which reduces the tube wall thickness to 0.036”. The corrosion rate of 3 mils is based on a conservative weight-loss rate for Inconel tubing in flowing 650 °F primary side reactor coolant fluid. The weight loss, when equated to a thinning rate and projected over a 40-year design objective with appropriate reduction after initial hours, is equivalent to 0.083-mils thinning. The assumed corrosion rate of 3 mils allows a conservative 2.917 mils for general corrosion thinning on the secondary side. An assumed corrosion rate increased by 50 percent from 3 to 4.5 mils has no effect on tube plugging criteria; therefore, the applicant has demonstrated in accordance with 10 CFR 54.21(c)(1)(iii) that the Steam Generator Program – Tube Integrity will manage the loss of material aging effect considered by this TLAA during the period of extended operation.

4.7.3.2 Staff Evaluation

The staff reviewed License Renewal Application Section 4.7.3, to verify, pursuant to Title 10 of the Code of Federal Regulations (10 CFR) 54.21(c)(1)(iii), that the effects of aging on the SG tube integrity will be adequately managed for the period of extended operation.

The VEGP Updated Final Safety Analysis Report (UFSAR) Section 5.4.2 describes allowances for erosion and corrosion that are partially based upon a measured material loss rate for 40 years. The UFSAR allowance for erosion and corrosion is much less than the allowed loss of material in the Vogtle SG Program. Therefore, increasing the projected material loss by 50 percent, to account for 60 years of operation, has been determined to have no significant effect upon the analysis.

The results of tube wall thinning analyses for the Vogtle Model F SG tubes, under normal operating and accident loading conditions, show that a minimum wall thickness of 0.014 inches is necessary to satisfy the stress limits of Regulatory Guide 1.121.

The nominal tube wall thickness of the Vogtle Model F SGs is 0.040 inches. Section 5.5.9, "Steam Generator (SG) Program," of the Vogtle TSs requires that SG tubes be plugged if they become 40 percent degraded from the nominal wall thickness (i.e., a wall thickness less than 0.024 inches). The minimum wall thickness for new tubes is 0.039 inches, which means an acceptable tube has a minimum wall thickness margin of 0.015 inches before plugging is required (0.039 – 0.024 = 0.015).

The projected total loss of tube wall thickness, due to corrosion and erosion on both primary and secondary sides of the tubes over 40 years, is 0.003 inches. The 0.003 inches is based on a conservative weight-loss rate for Inconel tubing in flowing, 650 °F, primary-side reactor coolant. The weight loss, when equated to a thinning rate and projected over a 40-year design objective (with appropriate reduction after initial hours) is equivalent to 0.000083 inches of wall thinning on the primary side of the SG tubes, thereby leaving a conservative 0.002917 inches for general corrosion thinning on the secondary side. Increasing the assumed total loss of tube wall thickness, from 0.003 inches over 40 years, to 0.0045 inches over 60 years, reduces the tube-wall thickness margin (above the tube plugging criteria) from 0.012 inches to 0.0105 inches, but has no effect on the tube plugging criteria. In addition to maintaining a significant margin above the minimum required wall thickness, the licensee performs periodic SG tube inspections to ensure that adequate structural and leakage integrity are maintained.

4.7.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of SG tube loss of material in LRA Section A.3.6.3. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's SG tube loss of material program is adequate.

4.7.3.4 Conclusion

Based on its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(iii), that the loss-of-material aging effect considered by this time-limited aging analysis (TLAA), will be adequately managed during the period of extended operation by the applicant's SG Program under section 5.5.9 of the TS. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Cold Overpressure Protection System

4.7.4.1 Summary of Technical Information in the Application

The cold-overpressure mitigation system is described in VEGP UFSAR Section 5.2.2.10. When the RCS is at temperatures below approximately 350°F, it is opened to the Residual Heat Removal (RHR) System for the purposes of removing residual heat from the core, providing a path for letdown to the purification subsystem, and controlling the RCS pressure when the plant is operating in a water solid mode. The RHR System is provided with self-actuated water relief valves to prevent overpressure in this relatively low design pressure system caused either within the system itself or from transients transmitted from the RCS. The RHRS relief valves mitigate pressure transients originating in the RCS to maximum pressure values determined by the relief valve set pressure.

The low design pressure RHR System is normally isolated from the high design pressure RCS during reactor power operation at temperatures above approximately 350°F by two isolation valves in series. Therefore, the RHR System can be inadvertently isolated from the RCS by these same isolation valves. The pressurizer power-operated relief valves (PORVs) and associated logic provide overpressure mitigation for those transients which could occur, if the RHR System isolation valves were inadvertently closed. The PORV logic is manually armed at the system setpoint.

Two pressurizer PORVs are each supplied with actuation logic. The logic for each PORV continuously monitors RCS temperature and pressure, converts an auctioneered RCS temperature to the Appendix G allowable pressure, and then compares the allowable pressure to the actual RCS pressure. As the actual RCS pressure approaches the allowable pressure, a main control board alarm is annunciated. If the RCS pressure continues to increase, an actuation signal is transmitted to a PORV and the valve opens to mitigate the transient. The setpoints for the pressurizer PORVs and arming temperature are developed in conjunction with the P-T curves using the NRC-approved methodology specified in Technical Specification 5.6.6 (Ref. 32) and are specified in the Pressure-Temperature Limits Report (PTLR). The current limits for these cold overpressure protection systems (COPS) setpoints are based on the 36 EFPY steady-state curves (in the PTLR), which are beltline conditions and are not compensated for pressure differences between the pressurizer transmitter and the reactor midplane/beltline or for instrument inaccuracies. These setpoints include an allowance for the 50°F thermal transport effect for heat injection transients. A calculation has been performed to confirm that the setpoints will maintain the system pressure within the established limits when the pressure difference between the pressure transmitter and reactor midplane and maximum temperature/pressure instrument uncertainties are applied to the setpoints. That calculation is a TLAA.

Each time the P-T limit curves are revised (see Section 4.2.5), the impact on the COPS setpoints is evaluated to ensure the functional requirements can be met. The P-T curves have been projected through the period of extended operation; however, operational needs will not require use of these curves before the period of extended operation. As described in the PTLR, the Reactor Vessel Surveillance Program (Appendix B.3.25) updates the P-T limit curves considering the data gained from capsules SNC pulls, and the content and update of the PTLR is in accordance with the VEGP Technical Specification 5.6.6. The P-T limit curves and the associated COPS setpoints will continue to be updated as operational needs dictate to bound the current level of neutron embrittlement (i.e., EFPY) for the unit. Therefore, this TLAA demonstration is made in accordance with 10 CFR 54.21(c)(1)(ii) and (iii).

4.7.4.2 Staff Evaluation

Paragraph IV.A.2 of 10 CFR Part 50, Appendix G, provides the criteria for generating the P-T limits that are required for commercial U.S. light-water reactors. As required by 10 CFR 50.36, licensees owning nuclear power production facilities must include the P-T limits and LTOP setpoints among the limiting conditions for operation (LCOs) in the plant TS. However, on August 31, 1996, the staff issued Generic Letter (GL) 96-03, “Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits,” and provided an acceptable process for revising the LCOs for plant-specific P-T limits and LTOP setpoints for relocating the actual P-T limit curves and LTOP setpoints out of the LCOs and into a PTLR. The GL also required that the PTLR be administratively controlled by the Administrative Controls Section of the TS.

The setpoints for the pressurizer PORVs and arming temperature are developed in conjunction with the P-T curves using the NRC-approved methodology specified in Technical Specification 5.6.6, “Technical Specifications Vogtle Electric Generating Plant (VEGP) Unit Nos. 1 and 2 Docket Nos.50-424 and 50-425 Appendix A to License Nos. NPF-68 and NPF-81, December 12, 2006 and are specified in the Pressure-Temperature Limits Report (PTLR) which was approved by the staff in a letter dated January 24, 2005 (ML050180168). The staff’s approval of the PTLR permits the applicant to generate the P-T limit curves and the cold overpressure protection systems (COPS) setpoints for the extended period of operation for VEGP, Units 1 and 2, without the need for a license amendment for the curves. The current limits for the COPS setpoints are based on the 36 EFPY steady-state curves (in the PTLR). Since the staff approved the PTLR, the P-T limit curves and the associated COPS setpoints will continue to be updated as operational needs dictate to bound the current level of neutron embrittlement (i.e., EFPY) for the VEGP units. Therefore, the staff finds the applicant’s statement to manage COPS set points acceptable because the change in COPS set points will be implemented in accordance with the facility’s current licensing basis which meets the regulatory requirements of 10 CFR Part 50, Appendix G.

4.7.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the unit’s LTOP limits in LRA Section A.3.6.4. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address the LTOP limits analysis is adequate.

4.7.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the analysis has been projected to the end of the period of extended operation, that 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).

4.7.5 Underclad Cracking of the Reactor Pressure Vessel

4.7.5.1 Summary of Technical Information in the Application

In the SNC letter of March 20, 2008, the applicant amended the LRA with LRA Section 4.7.5, “Underclad Cracking of the Reactor Pressure Vessel,” which provides the applicant’s time-limited aging analysis for managing underclad cracking in those reactor pressure vessel (RPV) components that are fabricated from SA 508, Class 2 forgings whose internal cladding was welded using a high heat submerged arc weld process. In the SNC letter of February 8, 2008, the applicant identifies that this TLAA is applicable to the following components:

- closure head dome flanges (LRA Table 3.1.2-1, AMR Item 4)
- primary inlet nozzles (LRA Table 3.1.2-1, AMR Item 17),
- primary outlet nozzles (LRA Table 3.1.2-1, AMR Item 20)
- RPV flanges (LRA Table 3.1.2-1, AMR Item 25)

The applicant identifies that the generic underclad cracking analysis in Westinghouse Report No. WCAP-15338 for Westinghouse-designed reactors is applicable to the design of the Votgle reactors and is a TLAA for these components. In this section of the LRA, the applicant stated that the thermal fatigue crack growth analysis in this report is bounding for 60 years of licensed operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.5.2 Staff Evaluation

10 CFR 54.21(c)(1) allows for TLAAs to be accepted in accordance with one of the following three options for TLAA acceptance:

(i) the analysis remains acceptable for the period of extended operation

(ii) the analysis has been projected through the expiration of the period of extended operation

(iii) the effects of aging on the intended function(s) will be managed for the period of extended operation

Non-proprietary Westinghouse Report No. WCAP-15338 provides a fracture toughness and flaw growth analysis for underclad cracks that are postulated in the internal cladding of SA-508 Class 2 or 3 alloy steel components in Westinghouse-design RPVs. The flaw growth analysis in the WCAP is based on ASME Section XI, Appendix A, fatigue flaw growth methods and is a generic TLAA for those Westinghouse reactors that credit the report to manage underclad cracking in their SA-508, Class 2 or 3 RVP forging components. The staff accepted the fracture toughness and flaw growth analyses in WCAP-15338 in a safety evaluation (SE) to the Westinghouse Owners Group (WOG) dated October 15, 2001.

The VEGP reactor units are both 4-loop Westinghouse Electric designed PWRs. In its generic safety analysis in WCAP-15338, Westinghouse evaluated the impact of 60 years of operation on underclad growth of cracks that had initiated in the internal cladding of Westinghouse-designed RPV components made from SA-508 Class 2 or 3 alloy steel forged materials. In the staff's SE on WCAP-15338, the staff identified two Renewal Applicant Action Items for PWR applicants that reference WCAP-15338 as a TLAA for their Westinghouse-design LRAs. In the first Renewal Action Item, for applicants owning Westinghouse 2-loop and 4-loop designed PWRs, the staff requested that the renewal applicant should demonstrate that the transients for normal, upset, emergency, faulted, and PTS conditions assessed in WCAP-15338 are bounding for the plant-specific transients for these conditions; otherwise, the staff requested that the applicant perform similar Section XI flaw evaluations using their plant-specific transients to demonstrate that their RPVs with underclad cracks are acceptable though 60 years of licensed operations.

The staff noted that the new TLAA section did not address why the transients for normal, upset, emergency, faulted, and PTS conditions, as assessed in WCAP-15338, were bounding for the VEGP-specific transients that are analyzed for in the normal, upset, emergency, faulted, and PTS condition assessments for the facility. In RAI 4.7.5-1, the staff requested that SNC provide clarification on how the normal, upset, emergency, faulted, and PTS conditions used in WCAP-15338 flaw evaluation bounds the plant-specific transients for these conditions at Votgle reactor units.

The applicant responded to RAI 4.7.5-1, in SNC Letter No. NL-08-0837, dated May 29, 2008. In its response, the applicant stated that the entire set transient cycles for operations or operational transients associated with normal, upset, emergency, faulted, and PTS conditions are described in LRA Table 4.3.1-1, and that the transients assumed in the fatigue flaw growth analysis of WCAP-15338 over 60 years of licensed operations bound the 60-year transient projections described in the LRA Table 4.3.1-1.

The staff noted that, in Section 5.4 of WCAP-15338, Westinghouse evaluated the fatigue induced crack growth that would occur in postulated flaws that have 2:1, 6:1, and 100:1 length to depth aspect ratios. The staff also noted that in the flaw growth analysis, Westinghouse considered the entire set of design basis transients for Westinghouse designed plants, considering the impact of each design basis transient of the postulated flaw sizes in the analysis. The staff verified that, in Westinghouse's flaw growth process, Westinghouse calculated the crack growth associated with limiting number cycles for each transient in the Westinghouse design basis transient set over a 60-year operational period, adding the crack growth increment to the original postulated flaw size, and then repeating the process until all transient cycles have been accounted for in the final analyzed flaw size.

The staff also verified that the design basis transients for VEGP Units 1 and 2 are described in LRA Table 4.3.1-1. Since the Westinghouse analysis covers the entire set of design basis transients for Westinghouse-designed nuclear reactors, the staff finds that the applicant has provided a valid basis on how the Westinghouse fatigue flaw growth analysis bounds the set of design basis transients for VEGP Units 1 and 2 through 60-years of licensed operations. Based on this review, the staff finds that the applicant has provided an acceptable basis for concluding that 60-year flaw growth analysis in WCAP-15338 is bounding for VEGP Units 1 and 2. Based on this review, the staff finds that the applicant has provided an acceptable response to RAI 4.7.5-1 and the staff's first renewal applicant action item on WCAP-15338 is resolved.

In the second Renewal Action Item identified in the staff's SE on WCAP-15338, the staff requested that the license renewal applicants referencing WCAP-15338 for RPV components provide a summary description of the TLAA evaluation in the UFSAR supplement. The staff's evaluated the applicant's UFSAR supplement for this TLAA in the next section.

The staff finds the applicant's TLAA evaluation of underclad cracking is acceptable in accordance with the requirements of 10 CFR 54.21(c)(1)(i) because the staff has verified that the Westinghouse flaw growth analysis for underclad cracks in Westinghouse RPV components made SA-508 Class 2 or 3 forged materials is bounding for VEGP RPV components that are made from SA-508 Class 2 or 3 materials.

4.7.5.3 UFSAR Supplement

Section 4.7 of the SRP-LR does not currently include a recommended UFSAR supplement summary description for TLAAs on underclad cracking of SA-508, Class 2 or 3 forging components.

In the second Renewal Action Item identified in the staff's SE on WCAP-15338, the staff recommended that the license renewal applicants referencing WCAP-15338 for RPV components provide a summary description of the TLAA evaluation in the UFSAR supplement for their applications. The staff has verified that the applicant has provided the following UFSAR supplement for TLAA Section 4.7.5 in SNC Letter No. NL-08-0195, dated March 20, 2008:

> Underclad Cracking of the Reactor Pressure Vessel There is no plant specific evaluation of underclad cracking at VEGP and no such cracks have been identified. Freedom from underclad cracking is ensured by special evaluation of the procedure qualification for cladding applied on low-alloy steel (SA-508, Class 2) in accordance with Reg. Guide 1.43. However, SNC conservatively includes underclad cracking as a TLAA. Analyses performed by Westinghouse in WCAP-1 5338 demonstrate that growth of under-clad cracks in Westinghouse reactor pressure vessels (RPVs) does not represent a significant challenge to reactor vessel integrity for an operating term of 60 years. The assumptions used as inputs to WCAP-1 5338 are applicable to VEGP. The results of these analyses demonstrate that under-clad cracking of reactor vessel components is not an aging effect requiring management for VEGP. TLAA disposition is in accordance with 10 CFR 54.21 (c)(1)(i)."

In its response to RAI 4.7.5-1, the applicant provided an acceptable technical clarification on how the how the normal, upset, emergency, faulted, and PTS conditions used in WCAP-15338 flaw evaluation bounds the plant-specific transients for these conditions at Votgle reactor units. The staff has provided its basis for resolving the request raised in RAI 4.7.5-1 in the *Staff Evaluation* section of the SER input for this TLAA. Based on this review, the staff finds the applicant's UFSAR supplement for the TLAA on underclad cracking to be acceptable in accordance with the requirements of 10 CFR 54.21(c)(1)(d) because the UFSAR supplement identifies a description on how the flaw growth analysis in WCAP-15338 is generically applicable and bounding for underclad cracking that are postulated in the VEGP RPV closure head dome flanges, RPV primary inlet nozzles, RPV primary outlet nozzles, and RPV flanges that are fabricated from SA-508, Class 2 alloy steel, and because the applicant's response to RAI 4.7.5-1 provides an acceptable basis why the normal, upset, emergency, faulted, and PTS conditions used in WCAP-15338 are bounding for the Votgle RPVs and can be used to meet the staff's first renewal applicant action item that is identified in Section 4.1 of the staff's SE on WCAP-15338.

4.7.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for fuel oil storage tank corrosion allowance, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also determined that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.8 <u>Conclusion for TLAAs</u>

The staff reviewed the information in LRA Section 4, "Time-Limited Aging Analyses." On the basis of its review, the staff concludes, that the applicant has provided a sufficient list of TLAAs, as defined in 10 CFR 54.3 and that the applicant has 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 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).

With regard to these matters, the staff concludes that there is reasonable assurance that the activities authorized by the renewed licenses will continue to be conducted in accordance with the CLB, and that 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.

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 Vogtle Electric Generating Plant, Units 1 and 2. The ACRS Subcommittee on Plant License Renewal will continue its detailed review of the LRA after this safety evaluation report (SER) is issued. Southern Nuclear Operating Company, Inc. (the applicant) and the staff of the United States (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 and the staff’s response to any issues and concerns reported.

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SECTION 6

CONCLUSION

The staff of the United States Nuclear Regulatory Commission (NRC or the staff) reviewed the license renewal application (LRA) for Vogtle Electric Generating Plant, Units 1 and 2, in accordance with NRC regulations and 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) sets the standards for issuance of a renewed license.

On the basis of its review of the LRA, the staff concludes that the requirements of 10 CFR 54.29(a) have been met.

The staff noted 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),” Supplement 34, “Regarding Vogtle Electric Generating Plant, Units 1 and 2 Draft Report for Comment,” dated April 2008.

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APPENDIX A

VEGP UNITS 1 AND 2 LICENSE RENEWAL COMMITMENTS

During the review of the Vogtle Electric Generating Plant (VEGP), Units 1 and 2, license renewal application (LRA) by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff), Southern Nuclear Operating Company, Inc. (the applicant) made commitments related to aging management programs (AMPs) to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment.

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
1	Implement the ACCW System Carbon Steel Components Program as described in VEGP LRA Section B.3.1.	A.2.1	Prior to the period of extended operation	B.3.1
2	Implement the Bolting Integrity Program as described in VEGP LRA Section B.3.2.	A.2.2	Prior to the period of extended operation	B.3.2
3	Enhance Boric Acid Corrosion Control Program documents to address the effects of borated water leakage onto materials other than steels, including electrical components (e.g., electrical connectors), that are susceptible to boric acid corrosion.	A.2.3	Prior to the period of extended operation	B.3.3

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
4	Implement the Buried Piping and Tanks Inspection Program as described in VEGP LRA Section B.3.4.	A.2.4	Prior to the period of extended operation	B.3.4
5	Implement the CASS RCS Fitting Evaluation Program as described in VEGP LRA Section B.3.5.	A.2.5	Prior to the period of extended operation	B.3.5
6	Enhance Closed Cooling Water Program documents to indicate the components in each system that are most susceptible to various corrosion mechanisms and to ensure that corrosion monitoring is appropriately accomplished. This qualitative assessment will be based on an understanding of corrosion principles associated with closed cooling water chemistries and on review of system, plant, and industry operating experience. Parameters considered in the review will include system flow parameters (focusing on identification of stagnant regions and on intermittently operated systems), normal operating temperatures, and component geometries (e.g. creviced areas).	A.2.6	Prior to the period of extended operation	B.3.6
7	Implement the External Surfaces Monitoring Program as described in VEGP LRA Section B.3.8.	A.2.8	Prior to the period of extended operation	B.3.8

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTIONS/ REFS
8	Implement the following enhancements to the Fire Protection Program: • Wall thickness evaluations will be performed on water suppression piping systems using non-intrusive volumetric testing or visual inspections to ensure that wall thicknesses are within acceptable limits. Initial wall thickness evaluations will be performed before the end of the current operating term. Subsequent evaluations will be performed at plant specific intervals during the period of extended operation. The plant specific inspection intervals will be determined based on previous evaluations and site operating experience. • A sample of sprinkler heads will be inspected using the guidance of NFPA 25 “Inspection, Testing and Maintenance of Water-Based Fire Protection Systems” (1998 Edition), Section 2-3.1.1, or NFPA 25 (2002 Edition), Section 5.3.1.1.1. Where sprinkler heads have been in service for 50 years, they will be replaced or representative samples from one or more sample areas will be submitted to a recognized testing laboratory for field service testing. This sampling will be performed every 10 years after the initial field service testing. The 50 years of time in service begins when the system was placed in service, not when the plant became operational. • Fire Protection Program procedures will be revised to provide more detailed instructions for visual inspection of Fire Pump Diesel fuel supply lines for leakage, corrosion, and general degradation while the engine is running during fire suppression system pump tests.	A.2.9	Prior to the period of extended operation, except for sprinkler head replacement or testing; Sprinkler head replacement or testing will be implemented prior to 50 years from time system was placed in service.	B.3.9

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
9	Enhance the Flux Thimble Tube Inspection Program by preparing an overall program procedure documenting the Flux Thimble Tube Inspection Program administration and implementing activities credited for license renewal.	A.2.11	Prior to the period of extended operation	B.3.11
10	Not Used at VEGP			
11	Implement the following enhancements to the Generic Letter 89-13 Program: • Develop an overall program procedure for the Generic Letter 89-13 Program to describe the various program activities that comprise the Generic Letter 89-13 Program and their implementing controls such as chemistry procedures, maintenance activities, scheduled surveillances, or other mechanisms. • Add inspection of the NSCW Transfer Pumps' casings and bolting. • Add the NSCW Cooling Tower spray nozzles as a specific item to be inspected during the cooling tower inspection.	A.2.12	Prior to the period of extended operation	B.3.12

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
12	Implement the Nickel Alloy Management Program for Non-Reactor Vessel Closure Head Penetration Locations as described in VEGP LRA Section B.3.14. The program will be based on the following commitments: (1) SNC will continue to participate in industry initiatives directed at resolving PWSCC issues, such as owner's group programs and the Electric Power Research Institute Materials Reliability Program. This is an ongoing commitment. (2) SNC will comply with applicable NRC Orders. This is an ongoing commitment. (3) SNC will submit a program inspection plan for VEGP that includes implementation of applicable Bulletins, Generic Letters, and staff accepted industry guidance. The inspection plan will also include assessments of each of the ten aging management program elements defined in Section A.1.2.3 of NUREG-1800 Revision 1. The inspection plan will be submitted to the staff for review and approval not less than 24 months prior to entering the period of extended operation for VEGP Units 1 and 2.	A.2.14	Prior to the period of extended operation Numbered items are implemented as noted in each item.	B.3.14

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
13	The Nickel Alloy Management Program for Reactor Vessel Closure Head Penetrations will implement commitments for reactor vessel closure head penetrations associated with nickel alloys from: (1) NRC Orders, Bulletins, and Generic Letters, and; (2) Staff-accepted industry guidelines.	A.2.15	Ongoing	B.3.15

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTION S/ REFS
14	Implement the following enhancements to the Oil Analysis Program: • An overall program procedure or guideline will be prepared to formalize the sampling and analysis activities performed. • Viscosity, relative level of oxidation, and flash point of lubricating oil samples will be determined for components where the lubricating oil is changed based on its analyzed condition (instead of being changed on a regular schedule regardless of condition). The relative level of oxidation of the lubricating oil will be monitored by analysis of the neutralization number or other appropriate parameter(s). Flash point monitoring will be performed for those components which have the potential for contamination of the lubricating oil with a light hydrocarbon such as fuel oil. • For components with periodic lubricating oil changes and components where the lubricating oil is changed based on analyzed condition, if a lubricating oil sample exceeds the limits established for the wear metal content screening, the lubricating oil from that component will be subjected to additional testing. The additional testing may include detailed particle counting, elemental analysis, or analytical ferrography as necessary to validate the initial screening results and to diagnose the source of the particulates.	A.2.16	Prior to the period of extended operation	B.3.16

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTION S/ REFS
15	Implement the One-Time Inspection Program as described in VEGP LRA Section B.3.17.	A.2.17	Inspections will be performed within a window of ten years prior to the period of extended operation.	B.3.17
16	Implement the One-Time Inspection Program for ASME Class 1 Small Bore Piping as described in VEGP LRA Section B.3.18.	A.2.18	Inspections will be performed within a window of ten years prior to the period of extended operation.	B.3.18

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTION S/ REFS
17	Implement the One-Time Inspection Program for Selective Leaching as described in VEGP LRA Section B.3.19.	A.2.19	Inspections will be performed within a window of ten years immediately prior to the period of extended operation.	B.3.19
18	Enhance the Periodic Surveillance and Preventive Maintenance Activities to include the following: • Steam Generator Blowdown Secondary Sample Bath Shell inspections • Steam Generator Blowdown Corrosion Product Monitor cooler shell inspections • Potable Water System water heater housing inspections (for the in-scope water heaters)	A.2.21	Prior to the period of extended operation	B.3.21
19	Implement the Piping and Duct Inspection Program as described in LRA Section B.3.22.	A.2.22	Prior to the period of extended operation	B.3.22

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
20	Implement the Reactor Vessel Internals Program as described in LRA Section B.3.24. The program will be based on the following commitments: (1) SNC will participate in the industry program for investigating and managing aging effects on reactor internals. This is an ongoing commitment. (2) SNC will evaluate and implement the results of the industry programs, such as the Electric Power Research Institute Material Reliability Program, as applicable to the VEGP reactor internals. This commitment will be fully implemented prior to the period of extended operation. (3) SNC will submit an inspection plan for the VEGP reactor internals to the NRC for review and approval not less than 24 months before entering the period of extended operation for VEGP Units 1 and 2. This inspection plan will address the bases, inspection methods, and acceptance criteria associated with aging management of the reactor vessel thermal sleeves and the core support lugs (along with the associated support pads and attachment welds).	A.2.24	Program implementation to be completed prior to the period of extended operation; Numbered items are implemented as noted in each item.	B.3.24

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
21	Implement the following enhancements to the Reactor Vessel Surveillance Program: (1) Prior to completion of testing of the last surveillance capsule in each unit, action will be taken to ensure that tested and untested specimens from all capsules removed from the VEGP reactor vessels remain in storage. (2) Alternate dosimetry will be installed to monitor neutron fluence on the reactor vessel after removal of the last surveillance capsule in that unit. This enhancement will be implemented prior to removal of the last surveillance capsule in each unit.	A.2.25	As noted in the numbered items	B.3.25
22	Not Used at VEGP			

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
23	Implement the following enhancements to the Structural Monitoring Program: • The scope of the Structural Monitoring Program will be expanded to include the additional structures that require monitoring for license renewal. • The scope of inspection for structures that require monitoring for license renewal will be clarified. An area-based inspection will be performed unless a detailed inspection scope is provided. • The Structural Monitoring Program scope for hangers and supports will be clarified. • Program requirements will be revised to include periodic ground water monitoring to confirm that groundwater chemistry remains non-aggressive as defined in NUREG 1801. • Underwater inspection of the NSCW cooling tower basins, including appropriate inspection and acceptance criteria, will be added to the Structural Monitoring Program.	A.2.32	Prior to the period of extended operation	B.3.32
24	Enhance the Structural Monitoring Program - Masonry Walls to include monitoring of masonry walls in the structures that are in scope for license renewal, but are not currently monitored under the program.	A.2.33	Prior to the period of extended operation	B.3.33

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTION S/ REFS
25	Implement the Non-EQ Cables and Connections Program as described in LRA Section B.3.34.	A.2.34	Implement program and complete first inspection prior to the period of extended operation	B.3.34
26	Implement the Non-EQ Inaccessible Medium-Voltage Cables Program as described in LRA Section B.3.35.	A.2.35	Implement program and complete first inspection prior to the period of extended operation	B.3.35
27	Implement the Non-EQ Cable Connections One-Time Inspection Program as described in LRA Section B.3.36.	A.2.36	Inspections will be performed within a window of five years immediately prior to the period of extended operation.	B.3.36

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
28	Implement the following enhancements to the Fatigue Monitoring Program: • Implementing documents will be revised to address the effect of the full structural weld overlays applied to the pressurizer spray and surge nozzles on the stress-based module calculation of CUF. • The VEGP UFSAR will be revised to require fatigue monitoring of the Accumulator/RHR nozzles and pressurizer heater penetrations. • Implementing documents will be revised to reduce acceptable CUF values to account for environmental fatigue effects for those NUREG-6260 locations monitored for fatigue. • The implementing procedure for the Fatigue Monitoring Program will be enhanced to explicitly require that the corrective action initiated for exceeding the acceptance criteria of a CUF less than or equal to 1.0 includes a review to identify and assess any additional affected reactor coolant pressure boundary locations.	A.2.38	No later than two years prior to the period of extended operation	B.3.38

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTIONS/ REFS
29	To ensure that the fatigue cycle limits are not exceeded, SNC will replace the steam generator secondary side handhole bolts after 30 years of service. The handhole bolts have been previously replaced and are scheduled to be replaced again during the spring outages in 2026 and 2028 for Units 1 and 2, respectively. Alternatively, a less restrictive replacement schedule may be developed and documented based on potential updated analyses initiated by the Bolting Integrity Program.	A.3.2.5	As stated in the commitment	4.3.5 B.3.2
30	To ensure that the fatigue cycle limits are not exceeded, SNC will replace the steam generator secondary side manway bolts after 30 years of service. The manway bolts have never been replaced and are scheduled for replacement during the spring outages in 2017 and 2019 for Units 1 and 2, respectively. Alternatively, a less restrictive replacement schedule may be developed and documented based on potential updated analyses initiated by the Bolting Integrity Program.	A.3.2.5	As stated in the commitment	4.3.5 B.3.2
31	The VEGP Pressure-Temperature Limits Report (for each unit) will be updated to address neutron embrittlement for a 60-year operating life, including any changes to the cold-overpressure mitigation system setpoints.	A.3.1.5 A.3.6.4	Prior to the period of extended operation	4.2.5 4.7.4

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTION S/ REFS
32	Implement a replacement schedule for the small diameter (≤ 2-inch) flexible hoses described below: • Radiation Monitoring System flexible hoses associated with the vent stack radiation monitor sample line. • Emergency Diesel Generator System flexible hoses associated with the fuel oil supply lines from the fuel oil headers to the fuel injector pumps. • ACCW System flexible hoses associated with the normal charging pump motor coolers. • Hydrogen Recombiner and Monitoring System flexible hoses associated with the calibration gas and oxygen bottles. • Main Steam System flexible hoses between the ARV hydraulic actuator and the hand pump unit. • Drain System flexible hoses installed on the Containment Bldg Tendon Gallery Sump Pump discharge lines. • Fire Protection System flexible hoses associated with the fire pump diesel fuel oil system.	None	Prior to the period of extended operation	2.3.3.25 2.3.3.20 2.3.3.6 2.3.3.20 2.3.4.1 2.3.3.23 2.3.3.19

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
33	Ensure the fatigue monitoring limits implemented as part of the Fatigue Monitoring Program are adequate to ensure that charging and letdown intermediate break location CUF values remain less than 0.1 for 60 years of operation.	A.3.2.1	No later than two years prior to the period of extended operation	4.3.1.7

VEGP License Renewal Future Action Commitment List				
ITEM NO.	COMMITMENT	UFSAR SUPPLEMENT LOCATION	SCHEDULE	RELATED LRA SECTION S/ REFS
34	The cranes within the scope of the Overhead and Refueling Crane Inspection Program are routinely inspected; however the existing procedures do not explicitly identify inspection of structural components for excessive wear, corrosion, and misalignment in all cases. As a result, SNC will enhance applicable plant procedures to explicitly identify inspection of crane rails and crane structural components for loss of material due to corrosion and wear, and for indication of rail misalignment: a) Procedure 93246-C "Polar Crane" will be enhanced to include inspection of crane rails and crane structural components (e.g., bridge) for loss of material due to corrosion; inspection of crane rails for loss of material due to wear, and for indication of rail misalignment. b) Procedure 27315-C "Spent Fuel Cask Crane" will be enhanced to include inspection of crane rails for loss of material due to corrosion. c) Procedure 27340-C "Refueling Machine" will be enhanced to include inspection of crane rails and crane structural components (e.g., bridge) for loss of material due to corrosion, and for indication of rail misalignment. d) Procedure 27342-C "Fuel Handling Machine Bridge Crane" will be enhanced to include inspection of crane rails and crane structural components (e.g., bridge) for loss of material due to corrosion; inspection of crane rails for loss of material due to wear, and for indication of rail misalignment.	A.2.20	Prior to the period of extended operation	B.3.20

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTIONS/ REFS**
35	SNC will revise the FatiguePro software to calculate a minimum projected value of 1 for any events that may potentially occur,	A.2.28	No later than two years prior to the period of extended operation	A.2.28
36	Once the NRC has accepted a process for addressing PWSCC of Alloy 82/182 welds in LBB evaluations, SNC will verify that the LBB evaluation in WCAP-10551-P, Addendum 1 meets the conditions of that process or have it re-performed using the acceptable process.	A.3.6.1	No later than two years prior to the period of extended operation	A.3.6.1
37	To ensure the Boral spent fuel racks will continue to perform their intended function during the period of extended operation, VEGP will monitor spent fuel pool aluminum concentrations and implement corrective actions if adverse trends are identified. Additionally, SNC will monitor industry experience related to Boral and will take appropriate actions if significant degradation of Boral is identified.	A.2.28	Prior to the period of extended operation	A.2.28
38	SNC commits to revise the FatiguePro initial CUF values for the Unit 1 and Unit 2 hot leg surge nozzles, pressurizer surge nozzles, and pressurizer heater penetrations to double the current values and recalculate the current and projected CUFs.	A.2.28	No later than two years prior to entering the period of extended operation.	A.2.28

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
39	SNC commits to implement a fatigue management software program that uses six stress components in the stress based fatigue calculation. The software will be appropriately benchmarked against an ASME NB-3200 fatigue analysis and the stress based fatigue monitoring locations will be modeled with the as-built configuration. The new software will be used to re-project 60-year CUF values for the monitored locations. When those locations were evaluated for environmental effects on fatigue, the new software will also be used to demonstrate that the environmental effects on fatigue will be adequately managed for those locations during the period of extended operation. This software will be put in service at least two years prior to the period of extended operation.	A.2.28	No later than two years prior to entering the period of extended operation.	A.2.28
40	The following changes will be made to the Structural Monitoring Program in order to enhance evaluation and trending of findings: 1) Guidance will be developed regarding proper documentation of condition adverse to quality and its probable causes for any CR written against a finding during structural monitoring program walkdown. 2) For any finding (e.g., crack, leakage, etc.) guidance will be developed for data to be collected and evaluated. 3) More explicit direction will be given for trending of the problems.	A.2.32	No later than two years prior to the period of extended operation	A.2.32

VEGP License Renewal Future Action Commitment List				
ITEM NO.	**COMMITMENT**	**UFSAR SUPPLEMENT LOCATION**	**SCHEDULE**	**RELATED LRA SECTION S/ REFS**
41	The following changes will be made to the IWE and IWL programs in order to enhance evaluation and trending of findings: 1) More explicit direction will be given to the Registered Professional Engineer for trending and evaluating conditions (including evidence of tendon grease leakage) identified during concrete visual examinations.	A.2.30 A.2.31	No later than two years prior to the period of extended operation	A.2.30 A.2.31

APPENDIX B

CHRONOLOGY

This appendix lists chronologically the routine licensing correspondence between the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) and Southern Nuclear Operating Company, Inc. (SNC). This appendix also lists other correspondence on the staff's review of the Vogtle Electric Generating Plant (VEGP), Units 1 and 2 license renewal application (LRA) (under Docket Nos. 50-424 and 50-425).

APPENDIX B: CHRONOLOGY	
Date	**Subject**
04/05/2007	Press Release, NRC to Discuss 2006 Performance at Vogtle Nuclear Plant., (ML070950086)
06/27/2007	Letter from Stinson L M, Southern Nuclear Operating Co, Inc to NRC Document Control Desk, Vogtle, Units 1 & 2, Application for License Renewal., (ML071840351)
06/30/2007	Environmental Report from Southern Nuclear Operating Co, Inc to NRC Document Control Desk, Vogtle, Units 1 and 2, Applicant's Environmental Report Operating License Renewal, (ML071840357)
06/30/2007	License-Application for Facility Operating License from Southern Nuclear Operating Co, Inc to NRC Document Control Desk, Vogtle, Units 1 and 2, License Renewal Application, (ML071840360)
07/10/2007	Letter from J. P. Leous, NRC to M. E. Sikes, Maintenance of Reference Materials Related to the Review of the Vogtle Electric Generating Plant Units 1 and 2 License Renewal Application at the Burke County Library., (ML071860391)
07/25/2007	Press Release-07-090 - License Renewal Application for Vogtle Nuclear Plant Available for Public Inspection., (ML072060326)
07/26/2007	Federal Register Notice - Receipt of Vogtle License Renewal Application., (ML071840090)
07/26/2007	Letter from P. T. Kuo to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Receipt of Vogtle License Renewal Application - Acknowledgment Letter (ML071860194)
08/01/2007	Meeting Agenda, from D. J. Ashley to Louise A. Lund, 08/21/2007, Notice of Public Information Meeting to Discuss the License Renewal Process for Vogtle, Units 1 and 2, Application Review, (ML072010412)
08/15/2007	Letter from P. T. Kuo NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Application from Southern Nuclear Operating Company, Inc., for Renewal of the Operating Licenses for the Vogtle Electric., (ML072010369)
08/15/2007	Federal Register Notice, : Vogtle Electric Generating Plant, Units 1 and 2., (ML072130084)

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08/16/2007	Press Release-07-103: NRC to Discuss Process for Review of License Renewal Application for Vogtle Nuclear Power Plant August 21., (ML072280386)
08/21/2007	Letter from Rani L. Franovich NRC, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Vogtle LRA NOI for Scoping - Letter., (ML072140306)
08/21/2007	Federal Register Notice, FRN - Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process., (ML072140337)
08/22/2007	Letter from Rani L. Franovich NRC to Colwell S,State of GA, Request for a List of Protected Species Within the Area Under Evaluation for the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review., (ML072040219)
08/22/2007	Letter from Rani L. Franovich NRC to Luce R,State of GA, Dept of Natural Resources, Vogtle Electric Generating Plant Units 1 and 2 License Renewal Application Review., (ML072060519)
08/22/2007	Letter from Rani L. Franovich NRC to Klima D L,US Advisory Council On Historic Preservation, Vogtle Electric Generating Plant Units 1 and 2, License Renewal Application Review., (ML072060568)
08/22/2007	Letter from Rani L. Franovich NRC to Bernhart D,US Dept of Commerce, National Marine Fisheries Service, Request for a List of Protected Species and Essential Fish Habitat Within the Area Under Evaluation for the Vogtle Electric Generating Plant Units 1 and 2 License Renewal Application Review., (ML072060605)
08/22/2007	Press Release-07-107: NRC Announces Opportunity to Request Hearing on Application to Renew Operating Licenses for Vogtle Nuclear Power Plant., (ML072340067)
08/23/2007	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc to NRC Document Control Desk, Vogtle - Requests that Listed Individuals Receive Correspondence Related to Plant License Renewal Correspondence., (ML072360026)
08/29/2007	Meeting Agenda, Meeting Notice, from D. J. Ashley to Louise A. Lund, 09/27/2007, Forthcoming Meeting Public Meeting to Discuss Environmental Scoping for Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072010123)
08/31/2007	Letter from Rani L. Franovich NRC to Cherokee Nation of Georgia regarding Vogtle License Renewal Process., (ML072070113)
08/31/2007	Letter from Rani L. Franovich NRC to Catawba Indian Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review, (ML072070691)
08/31/2007	Letter from Rani L. Franovich NRC to American Cherokee Confederacy, Inc, Regarding Vogtle License Renewal Process., (ML072140791)

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08/31/2007	Letter from Rani L. Franovich NRC to Principal Chief A.D. Ellis of the Muscogee (Creek) Nation, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML072210286)
08/31/2007	Letter from Rani L. Franovich NRC to Terry S, Miccosukee Indian Tribe, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210294)
08/31/2007	Letter from Rani L. Franovich NRC to Anoatubby B, Chickasaw Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review, (ML072210312)
08/31/2007	Letter from Rani L. Franovich NRC to Norris G, Lower Eastern Cherokee Nation of South Carolina, Piedmont American Indian Association, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210315)
08/31/2007	Letter from Rani L. Franovich NRC to Chief Tanner of the Chaloklowa Chickasaw Indian People, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML072210338)
08/31/2007	Letter from Rani L. Franovich NRC to Scott R, Santee Indian Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210347)
08/31/2007	Letter from Rani L. Franovich NRC to Thurmond C, Georgia Tribe of Eastern Cherokee, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210364)
08/31/2007	Letter from Rani L. Franovich NRC to Carleton K H, Mississippi Band of Choctaw Indians, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review, (ML072210373)
08/31/2007	Letter from Rani L. Franovich NRC to Chief Bolton of Pee Dee Indian Nation of Upper South Carolina, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML072210375)
08/31/2007	Letter from Rani L. Franovich NRC to McCoy K, Eastern Band of Cherokee Indians, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review, (ML072210498)
08/31/2007	Letter from Rani L. Franovich NRC to Chief Caulder of the Pee Dee Indian Tribe of South Carolina, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML072210551)
08/31/2007	Letter from Rani L. Franovich NRC to Bucktrot E, Kialegee Tribal Town, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210575)

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08/31/2007	Letter from Rani L. Franovich NRC to Chief J. Webb of the Waccamaw Indian People, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML072210590)
08/31/2007	Letter from Rani L. Franovich NRC to Chief W. Steele of Seminole Tribe of Florida, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML072210633)
08/31/2007	Letter from Rani L. Franovich NRC to ,Eastern Cherokee, Southern Iroquois & United Tribes of South Carolina, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210646)
08/31/2007	Letter from Rani L. Franovich NRC to Bear J A, Muscogee (Creek) Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210668)
08/31/2007	Letter from Rani L. Franovich NRC to Wassaamasaw Tribe of Varnertown Indians, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210744)
08/31/2007	Letter from Franovich R to L.P. Bowlegs of the Seminole Nation of Oklahoma, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application, (ML072210746)
08/31/2007	Letter from Rani L. Franovich NRC to Thomas D, Alabama-Coushatta Tribe of Texas, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210817)
08/31/2007	Letter from Rani L. Franovich NRC to Allen R L, Cherokee Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210861)
08/31/2007	Letter from Rani L. Franovich NRC to Zachary J, Coushatta Indian Tribe, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210880)
08/31/2007	Letter from Rani L. Franovich NRC to ,American Indian Chamber of Commerce of South Carolina, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210901)
08/31/2007	Letter from Rani L. Franovich NRC to ,Georgia Tribe of Eastern Cherokee, Letter to GA Tribe of Eastern Cherokee, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review., (ML072210937)
08/31/2007	Letter from Rani L. Franovich NRC to Proctor D, United Keetoowah Band of Cherokee Indians, Letter to Chief D. Proctor of the United Keetoowah Band of Cherokee Indians, re: Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review., (ML072210950)

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08/31/2007	Letter from Rani L. Franovich NRC to Nail V, Chickasaw Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072210995)
08/31/2007	Letter from Rani L. Franovich NRC to Chavis C L, The Beaver Creek Indians, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072211003)
08/31/2007	Letter from Rani L. Franovich NRC to ,Lower Muscogee Creek Tribe, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072211004)
08/31/2007	Letter from Rani L. Franovich NRC to Holland E S, United Keetoowah Band of Cherokee Indians, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072211008)
08/31/2007	Letter from Rani L. Franovich NRC to Kaniatobe K, Absentee-Shawnee Tribe of Oklahoma, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072211009)
08/31/2007	Letter from Rani L. Franovich NRC to Tullis E, Poarch Band of Creek Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072211013)
08/31/2007	Letter from Rani L. Franovich NRC to Thrower G, Poarch Band of Creek Nation, Request for Comments Concerning the Vogtle Electric Generating Plant, Units 1 and 2 License Renewal Application Review., (ML072211016)
08/31/2007	Inspection Plan, from Charles Casto, NRC/RGN-II, to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Vogtle, Inspection Plan Report 22, for 09/01/2007 - 03/31/2009., (ML072430522)
09/05/2007	Letter from J. P. Leous, NRC, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Environmental Site audit Regarding Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application (TAC Nos. MD5905 and MD5906)., (ML072400136)
09/11/2007	Letter from Bernhart D, US Dept of Commerce, National Oceanic & Atmospheric Admin (NOAA), to Rani L. Franovich NRC, re: Renewal of Operating Licenses for Vogtle Electric Generating Plant, Units 1 and 2 & List of Federally-Protected Species., (ML072670546)
09/11/2007	Letter from Bernhart D M, US Dept of Commerce, National Oceanic & Atmospheric Admin (NOAA), to Rani L. Franovich ,NRC/NRR/ADRO/DLR, Response to NRC Letter Dated 08/22/07, re: Renewal of Operating Licenses for Vogtle Electric Generating Plant, Units 1 & 2. Forwards List of Federally-protected Species under Jurisdiction of National Marine Fisheries Service for the State of Georgia., (ML073530493)
09/19/2007	Memoranda, from K. C. Chang to Louise A. Lund, audit and Review Plan for Plant Aging Management Programs, Aging Management Reviews, and Time-Limited Aging Analyses for the Vogtle Electric Generating Plant, Units 1 and 2, (Tac Nos. MD5903 and MD5904)., (ML072560073)

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09/20/2007	Press Release-II-07-047 - NRC to Solicit Public Input Sept. 27 in Waynesboro as Part of Vogtle Nuclear Plant License Renewal Application Review., (ML072630434)
09/27/2007	Meeting Transcript, from Environmental Scoping Meeting for Vogtle, Units 1 and 2, License Renewal Application - afternoon session., (ML072840529)
09/27/2007	Meeting Transcript Environmental Scoping Meeting Transcripts for Vogtle, Units 1 and 2, License Renewal Application - evening session., (ML072840530)
10/01/2007	Meeting Agenda Vogtle Scoping Meeting Handouts (ML072750264)
10/11/2007	Memoranda, Request for Additional Information (RAI), from Mark Rubin to Rani L. Franovich NRC , Request for Additional Information to Support the Staff's Severe Accident Mitigation Alternative Review for Vogtle Electric Generation Plant (TAC MD5905 and MD5906)., (ML072750508)
10/12/2007	Letter from J. P. Leous, NRC, NRC to Southern Nuclear Operating Co, Inc, Summary of Public Environmental Scoping Meetings Related to the Review of the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application (TAC Nos. MD5905 and MD5906)., (ML072840963)
10/12/2007	Letter from George B J, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle Electric Generating Plant, Revision 14 to the Updated Final Safety Analysis Report, 10 CFR 50.59 Report, and Technical Specification Bases Changes., (ML072970843)
10/12/2007	Updated Final Safety Analysis Report (UFSAR), from Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle, Units 1 and 2, UFSAR Revision 14, Section 10.0, Steam and Power Conversion System through End., (ML072970857)
10/24/2007	Letter Request for Additional Information (RAI), from J. P. Leous, NRC, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Request for Additional Information Regarding Severe Accident Mitigation Alternatives for Vogtle Electric Generating Plant, Units 1 and 2, License Renewal (TAC Nos. MD5905 and 5906), (ML072841107)
11/05/2007	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to NRC Document Control Desk, Vogtle, Units 1 and 2 - Transmittal of License Renewal Application Environmental Site audit Information Request., (ML073240371)
11/12/2007	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to NRC Document Control Desk, Vogtle License Renewal Application - Environmental Site audit Information Request - Follow up Response., (ML073300604)
11/16/2007	Letter from J. P. Leous, NRC, NRC to Southern Nuclear Operating Co, Inc, Summary of Conference Call with Southern Nuclear Operating Company, Inc., to Discuss the Severe Accident Mitigation Alternatives Requests for Additional Information for Vogtle Electric Generating Plant, Units 1 and 2., (ML073120119)

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11/19/2007	Meeting Summary, from J. P. Leous, NRC to Southern Nuclear Operating Co, Inc, Summary of Site audit Related to the Review of the License Renewal Application for Vogtle Electric Generating Plant, Units 1 and 2 (TAC Nos. MD5905 and MD5906)., (ML073111213)
12/10/2007	Memoranda, Request for Additional Information (RAI), from Rajender Auluck to Louise A. Lund, Request for Additional Information Regarding the Southern Nuclear Operating Company, Inc., License Renewal Application for the Vogtle Electric Generating Plant, Dated June 29, 2007., (ML073370344)
12/11/2007	Memoranda, Request for Additional Information (RAI), from Klein A R/ADRA/DRA/AFPB, to Louise A. Lund, Request for Additional Information License Renewal Application Vogtle Electric Generating Plant Units 1 and 2 TAC No. MD5903 and MD5904., (ML073440088)
12/11/2007	Memoranda, Request for Additional Information (RAI), from Cranston G V/ADES/DSS, to Louise A. Lund, RAI Regarding the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application, (ML073450435)
12/14/2007	Memoranda, Request for Access Authorization, from Harrison D G/ADES/DSS/SBPB, to Louise A. Lund, Request for Additional Information, Balance of Plant - Vogtle Steam Electric Station License Renewal Application (TAC NOS. MD5903 and MD5904)., (ML073400500)
12/20/2007	Letter License-Application for Facility Operating License (Amend/Renewal) DKT 50, Request for Additional Information (RAI), from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to NRC Document Control Desk, Vogtle - Request for Additional Information Regarding the Analysis of Severe Accident Mitigation Alternatives., (ML073580627)
12/26/2007	Memoranda, Request for Additional Information (RAI), from Robert Dennig to Louise A. Lund, Vogtle License Renewal, Request for Additional Information (TAC MD5903 and MD5904)., (ML073520031)
12/27/2007	Memoranda, from Alan Hiser to Louise A. Lund , Vogtle Electric Generating Plants Units 1 and 2 -Request for Additional Information Regarding the Time Limiting Aging Analysis for the Steam Generator Tube Loss of Material (TAC MD5903 AND MD5904). , (ML073610598)
01/03/2008	Environmental Impact Statement, Letter from Louise A. Lund to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Issuance of Environmental Scoping Summary Report Associated with the Staff's Review of the Application By Southern Nuclear Operating Company, Inc. For Renewal of the Operating License for Vogtle Electric Generating Plant, Units 1 & 2., (ML073440432)
01/17/2008	Memoranda, Request for Additional Information (RAI), from Kamal Manoly to Louise A. Lund, Request for Additional Information Related to Section 2.4, "Scoping and Screening Results: Structures," and Section 4.5, "Concrete Containment Tendon Prestress" of Vogtle Electric Generating Plant Units 1 and 2 License Renewal Application., (ML080170546)

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01/22/2008	Letter Request for Additional Information (RAI), from D. J. Ashley, NRC, to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Request for Additional Info for the Review of the Vogtle Electric Generating Plant, Units 1 and 2, LRA., (ML080080406)
01/23/2008	Memoranda, Request for Additional Information (RAI), from Terence Chan to Louise A. Lund, Request for Additional Information for Vogtle, Units 1 and 2, License Renewal Application (TAC Nos. MD5903 and MD5904)., (ML080250193)
01/28/2008	Letter Request for Additional Information (RAI), from D. J. Ashley, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Request for Additional Information for the Review of the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML080080416)
01/28/2008	Letter Meeting Summary, from D. J. Ashley, NRC, Summary of Telephone Conference Call Held on January 16, 2008, Between the US Nuclear Regulatory Commission and Southern Nuclear Operating Company, Inc., Concerning Request for Additional Information Pertaining to the Vogtle Units 1 & 2, License Renewal., (ML080170368)
01/28/2008	Letter Request for Additional Information (RAI), from D. J. Ashley, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Request for Additional information for the Review of the Vogtle Electric Generating Station, Units 1 and 2, License Renewal Application, Sections 2.4, 4.2, and 4.5., (ML080170653)
02/01/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle, Units 1 and 2 - License Renewal Application, Follow Up to Severe Accident Mitigation Alternatives Request for Additional Information Review Questions., (ML080360158)
02/08/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle, Units 1 & 2 - License Renewal - audit Question Responses., (ML080430373)
02/11/2008	Meeting Summary from J. P. Leous, NRC, Summary of Conference Call with Southern Nuclear Operating Company, Inc., to Discuss the Severe Accident Mitigation Alternatives Requests for Additional Information for Vogtle Electric Generating Plant, Units 1 and 2 (TAC Nos. MD5905 and MD5906)., (ML080240172)
02/11/2008	Note to File including Telecon Record, from D. J. Ashley, NRC, Summary of Teleconference Between the NRC and Southern Nuclear Operating Company, Inc., Concerning Request for Additional Information Pertaining to Vogtle, Units 1 and 2, License Renewal Application., (ML080250159)
02/12/2008	Memoranda, Request for Additional Information (RAI), from M. A. Mitchell to Louise A. Lund, Request for Additional Information on Time Limited Aging Analyses of Reactor Vessels and Internals, Vogtle Nuclear Plant, Units 1 and 2 License Renewal Application (TAC Nos. MD5903 and MD5904)., (ML080440396)

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02/19/2008	Memoranda from Mark Rubin to Louise A. Lund, Evaluation of Severe Accident Mitigation Alternatives for License Renewal of Vogtle, Units 1 and 2 (TAC Nos. MD5905 and MD5096)., (ML080440274)
02/21/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle, Units 1 and 2, License Renewal - Responses to 01/22/2008 RAIs., (ML080560267)
02/27/2008	Letter Request for Additional Information (RAI), from D. J. Ashley, NRC, to Tom E. Tynan, Southern Co, Generation, Request for Additional Information for the Review of the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Section 4.2., (ML080510365)
02/27/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle, Units 1 & 2, Response to 01/28/2008 Request for Additional Information., (ML080600405)
03/17/2008	Memoranda, from Rajender Auluck to Louise A. Lund, Scoping and Screening Methodology audit Trip Report for the Southern Nuclear Operating Company, Inc., License Renewal Application for the Vogtle Electric Generating Plant, Units 1 and 2., (ML080640502)
03/20/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle License Renewal Application Amendment 1 and Updated Future Action Commitment List., (ML080810440)
03/26/2008	Meeting Summary, from D. J. Ashley, NRC to Southern Nuclear Operating Co, Inc, Summary of Telephone Conference with Southern Nuclear Operating Company, Inc., Concerning RAI Pertaining to the Vogtle Electric Generating Plant, Unit 1 and 2, License Renewal Application., (ML080710453)
03/31/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle - Responses to 02/27/2008 Requests for Additional Information re: License Renewal., (ML080930299)
04/03/2008	Memoranda, Safety Evaluation, from Greg Cranston to Louise A. Lund, Safety Evaluation Regarding the Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application., (ML080940019)
04/09/2008	Letter from Louise A. Lund, NRC to D. Bernhart, US Dept of Commerce, National Marine Fisheries Service, Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review., (ML080800027)
04/09/2008	Letter from Louise A. Lund, NRC to R. Luce, State of GA, Dept of Natural Resources, Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review., (ML080800063)
04/09/2008	Letter from Louise A. Lund, NRC to M. Usha, US Environmental Protection Agency (EPA), Notice of Availability of the Draft Plant-Specific Supplement 34 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) Regarding Vogtle Electric Generating Plant, Units 1 and 2., (ML080800222)

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04/09/2008	Letter from Louise A. Lund, NRC to R. Perry, State of SC, Dept of Natural Resources, Vogtle Electric Generating Plant, Units 1 and 2, License Renewal Application Review., (ML080810005)
04/18/2008	Memoranda, from George Wilson to Louise A. Lund, Vogtle Electric Generating Plant - Safety Evaluation Input - License Renewal Application, Section 2.5, TAC Nos. MD5903 and MD5904., (ML081090626)
04/21/2008	Letter from Louise A. Lund, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Notice of Availability of the Draft Plant-Specific Supplement 35 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (GEIS) Regarding Vogtle Electric Generating Plant, Units 1 and 2 (Nos. MC5905 and MC5906)., (ML080780087)
04/21/2008	Meeting Notice, Memoranda, from J. P. Leous, NRC to Louise A. Lund, Forthcoming Meeting to Discuss the Draft Supplemental Environmental Impact Statement For The License Renewal of Vogtle Electric Generating Plant, Units 1 & 2., (ML080920231)
04/21/2008	Federal Register Notice, from Louise A. Lund, NRC Notice of Availability of the Draft Plant-Specific Supplement 34 to the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (TAC MC5905 and TAC MD5906), (ML081120279)
04/22/2008	Letter Meeting Notice, from G. T. Hopper, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, 06/06/2008 Notice of Public Meeting with Southern Nuclear Co. On License Renewal Inspection Exit., (ML081130657)
04/28/2008	Letter Request for Additional Information (RAI), from D. J. Ashley, NRC to Tom E. Tynan, Southern Nuclear Operating Co, Inc, Vogtle, Units 1 & 2, Request for Additional Information, Review of License Renewal Application, Sections 3.3, 4.3 & 4.7.1., (ML081080189)
05/01/2008	Memoranda, Safety Evaluation, from Alan Hiser to Louise A. Lund, Safety Evaluation Input For Vogtle Electric Generating Plant Units 1 And 2 Regarding The Time Limiting Aging Analysis For Steam Generator Tube Loss Of Material (TAC NOS. MD5903 And MD5904)., (ML081221029)
05/05/2008	Memoranda, Safety Evaluation, from Terence Chan to Louise A. Lund, Safety Evaluation Input - Vogtle Electric Generating Plant Units 1 And 2, License Renewal Application., (ML081270730)
05/09/2008	Memoranda from Robert Dennig to Louise A. Lund, Safety Evaluation Report Input, License Renewal Application Vogtle Electric, Generating Plant, Unit 1 (TAC No. MD5903) and Unit 2 (MD5904)., (ML081190325)
05/13/2008	Meeting Summary, D. J. Ashley, NRC, Summary of Telephone Conference with Southern Nuclear Operating Company, Inc., Concerning Scoping and Screen RAI Pertaining to the Vogtle Electric Generating Plant, Unit 1 and 2, License Renewal Application., (ML081290027)
05/15/2008	Memoranda, Safety Evaluation Report, from Matthew Mitchell to Louise A. Lund, Vogtle Nuclear Plant, Units 1 and 2 License Renewal Application - Final Safety Evaluation Report Sections for Time Limited Aging Analyses (TAC NOS. MD5903 and MD5904)., (ML081360160)

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05/15/2008	Memoranda, Safety Evaluation Report, Draft, from Matthew Mitchell to Louise A. Lund, Vogtle Nuclear Plant, Units 1 and 2 License Renewal Application - Final Safety Evaluation Report Section For The Aging Management Program For The Reactor Vessel (TAC NOS. MD5903 and MD5904)., (ML081360235)
05/15/2008	Press Release-II-08-032: NRC Issues Draft Environmental Impact Statement For Vogtle Nuclear Plant License Renewal; Public Meeting June 3., (ML081360398)
05/16/2008	Memoranda, from Donald Harrison to Louise A. Lund, Transmittal of Draft Safety Evaluation for Vogtle Electric Generating Plant License Renewal Application (TAC Nos. MD5903 and MD5904)., (ML081300608)
05/29/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to ,NRC Document Control Desk, Vogtle, Units 1 and 2, License Renewal - Responses to 04/28/2008 RAIs., (ML081500825)
05/30/2008	Memoranda, Report, Miscellaneous, from Kamal Manoly to Louise A. Lund, Input to Safety Evaluation for Section 2.4, “Section 4.5,” Concrete Containment Tendon Prestress: of Vogtle Electric Generating Plant Units 1 and 2 License Renewal Application., (ML081540013)
06/02/2008	Press Release-II-08-034: NRC Staff to Meet with Vogtle Nuclear Plant Officials to Discuss Nuclear Plant License Renewal Inspection., (ML081540316)
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APPENDIX B: CHRONOLOGY	
Date	**Subject**
06/30/2008	Letter from J. P. Leous, NRC to Southern Nuclear Operating Co, Inc, 06/03/2008 Summary of Public Meeting on Draft Supplemental Environmental Impact Statement Regarding the Vogtle, Units 1 and 2, License Renewal Review., (ML081640259)
07/14/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to NRC Document Control Desk, Vogtle, Units 1 & 2, License Renewal Application Comments on Draft Generic Environmental Impact Statement for License Renewal of Nuclear Plants, Supplement 34., (ML081990212)
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07/18/2008	Inspection Report, Letter from K. M. Kennedy to Tom E. Tynan, Southern Nuclear Operating Co, Inc, IR 05000424-08-006 and 05000425-08-006; on May 19, 2008 - June 06, 2008; Vogtle Electric Generating Station, Unit 1 and 2; License Renewal Inspection Program, Aging Management Programs., (ML082000869)
08/11/2008	Letter from Tom E. Tynan, Southern Nuclear Operating Co, Inc, to NRC Document Control Desk, Vogtle, Units 1 and 2, License Renewal - Revised Updated Future Actions Commitment List, (ML082240518)

APPENDIX C

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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 lists the references used throughout this safety evaluation report (SER) for review of the license renewal application (LRA) for Vogtle Electric Generating Plant, Units 1 and 2.

APPENDIX D: REFERENCES
NUREG-1800, Revision 1, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” September 2005.
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NEI 95-10, Revision 6, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule,” June 2005.