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NUREG-1915

Safety Evaluation Report

Related to the License Renewal of Wolf Creek Generating Station

Docket No. 50-482

Wolf Creek Nuclear Operating Corporation

Office of Nuclear Reactor Regulation

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the Wolf Creek Generating Station (WCGS), Unit 1, license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated September 27, 2006, Wolf Creek Nuclear Operating Corporation (WCNOC 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." WCNOC requests renewal of the WCGS operating license (Facility Operating License Number NPF-42) for a period of 20 years beyond the current expiration at midnight March 11, 2025.

WCGS is located approximately 3.5 miles northeast of Burlington, Kansas. The NRC issued the construction permit for WCGS on May 31, 1977, and operating license on June 4, 1985. WCGS Unit 1 is of a PWR design. Westinghouse Electric Corporation supplied the nuclear steam supply system and Daniel International originally designed and constructed the balance of the plant with the assistance of its agent, Bechtel. The WCGS Unit 1 licensed power output is 3565 megawatt thermal with a gross electrical output of approximately 1228 megawatt electric.

This SER presents the staff's review of information submitted through August 1, 2008, the cutoff date for consideration in the SER, and the final conclusion on the LRA review.

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ABBREVIATIONS

A/C	alternating current
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
ADAMS	Agencywide Document Access and Management System
AERM	aging effect requiring management
AFW	auxiliary feedwater
AISC	American Institute of Steel Construction
ALARA	as low as reasonably achievable
AMP	aging management program
AMR	aging management review
APCSB	Auxiliary and Power Conversion Systems Branch
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
BC-TOP	Bechtel Topical Report
BLA	building, level, or areas
B&PVC	Boiler and Pressure Vessel Codes
BTP	Branch Technical Position
BWR	boiling water reactor
CASS	cast austenitic stainless steel
CCWS	component cooling water system
CFR	*Code of Federal Regulations*
CISI	containment inservice inspection
CLB	current licensing basis
CMAA-70	Crane Manufacturers Association of America No. 70
COB	Center of Business
COMS	cold overpressurization mitigation system
CRD	control rod drive
CRDM	control rod drive mechanism
CST	condensate storage tank
CUF	cumulative usage factor
CVCS	chemical and volume control system
DBD	design basis documents
DBE	design basis event
DWST	demineralized water storage tank
1 D	one dimensional
ECCS	emergency core cooling system

ECT	eddy current testing
EDG	emergency diesel generator
EFPY	effective full-power year
EHC	electrohydraulic control
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification
EQSD	equipment qualification summary document
EQWP	equipment qualification work packages
ESF	engineered safety feature
ESFS	engineered safety feature system
ESW	essential service water
ESWS	essential service water system
FAC	flow-accelerated corrosion
FPCC	fuel pool cooling and cleanup
FR	*Federal Register*
FSAR	final safety analysis report
FSSD	fire safe shutdown
FW	feedwater
GALL	Generic Aging Lessons Learned
GDC	general design criteria or general design criterion
GEIS	Generic Environmental Impact Statement
GL	generic letter
GSI	generic safety issue
HELB	high-energy line break
HPCI	high-pressure coolant injection
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and controls
IASCC	irradiation assisted stress corrosion cracking
IGSCC	intergranular stress corrosion cracking
IN	information notice
IPA	integrated plant assessment
ISG	interim staff guidance
ISI	inservice inspection
LBB	leak-before-break
LOCA	loss of coolant accident
LTOP	low-temperature overpressure protection
LRA	license renewal application
LRBD	license renewal boundary drawing
MIC	microbiologically influenced corrosion
MSIV	main steam isolation valve
MWt	megawatt thermal

NDE	nondestructive examination
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NSAC	Nuclear Safety Analysis Center
NUMARC	Nuclear Management and resources Council
OBE	operating basis earthquake
OCCW	open-cycle cooling water
OI	open item
PRM	process radiation monitoring
P-T	pressure_temperature
PTLR	pressure temperature limits reports
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RAI	request for additional information
RCPB	reactor coolant pressure boundary
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
RPV	reactor pressure vessel
RT_{NDT}	reference temperature nil ductility transition
RT_{PTS}	reference temperature for pressurized thermal shock
RVI	reactor vessel internals
RWST	refueling water storage tank
SBO	station blackout
SC	structure and component
SCC	stress-corrosion cracking
SER	safety evaluation report
SGBS	steam generator blowdown system
SRP-LR	Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants
SSC	system, structure, and component
SSE	safe-shutdown earthquake
SV	safety valve
TLAA	time-limited aging analysis

TS	technical specifications
UHS	ultimate heat sink
US	United States
USAR	Updated Safety Analysis Report
USE	upper-shelf energy
UT	ultrasonic testing
WCAP	Westinghouse Commercial Atomic Power
WCGS	Wolf Creek Generating Station
WCNOC	Wolf Creek Nuclear Operating Corporation

SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) on the license renewal application (LRA) for Wolf Creek Generating Station (WCGS) Unit 1, as filed by the Wolf Creek Nuclear Operating Corporation (WCNOC or the applicant). By letter dated September 27, 2006, WCNOC submitted its application to the US Nuclear Regulatory Commission (NRC) for renewal of the WCGS operating license for an additional 20 years. The NRC staff (the staff) prepared this report to summarize the results of its safety review of the LRA for compliance with Title 10, Part 54, "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 Tam Tran. Mr. Tran may be contacted by telephone at 301-415-3617 or by electronic mail at Tam.Tran@nrc.gov. Alternatively, written correspondence may be sent to the following address:

License Renewal and Environmental Impacts Program
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Tam Tran, Mail Stop 011-F1

In its September 27, 2006, submission letter, the applicant requested renewal of the operating license issued under Section 103 (Operating License No. NPF-42) of the Atomic Energy Act of 1954, as amended, for WCGS for a period of 20 years beyond the current expiration at midnight March 11, 2025. WCGS is located approximately 3.5 miles northeast of Burlington, Kansas. The NRC issued the construction permit for WCGS on May 31, 1977, and the operating license on June 4, 1985. WCGS Unit 1 is of a PWR design. Westinghouse Electric Corporation supplied the nuclear steam supply system and Daniel International originally designed and constructed the balance of the plant with the assistance of its agent, Bechtel. The WCGS Unit 1 licensed power output is 3565 megawatt thermal with a gross electrical output of approximately 1228 megawatt electric. The updated safety analysis report (USAR) 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 WCGS 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 1, 2008. The public may view the LRA and all pertinent information and materials, including the USAR, 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 Coffey County Library, Burlington Branch, located in 410 Juniatta Street, Burlington, KS 66839. In addition, the public may find the LRA, as well as materials related to the license renewal review, on the NRC Web site at http://www.nrc.gov.

This SER summarizes the results of the staff's safety review of the LRA and describes the technical details considered in evaluating the safety aspects of the unit's proposed operation for an additional 20 years beyond the term of the current operating license. The staff reviewed the LRA in accordance with 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 license. 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 renewal of WCGS. The staff issued the final plant-specific GEIS Supplement 32, "Generic Environmental Impact Statement for License Renewal Plants Regarding Wolf Creek Generating Station," in May 2008.

1.2 <u>License Renewal Background</u>

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). Subsequently, 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 pursuant to 10 CFR Part 54. To establish a scope of review for license renewal, 10 CFR Part 54 defined age-related degradation unique to license renewal; however, during the demonstration program, the staff found that 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 staff 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 staff made these rule changes 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).

Concurrently with these initiatives, the staff pursued a separate rulemaking effort 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.

1.2.1 Safety Review

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

(1) The regulatory process is adequate to ensure that the licensing bases of all currently operating plants maintain an acceptable level of safety with the possible 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 USAR 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 used NEI 95-10 in addition to the SRP-LR (NRC methodology for reviewing LRAs) to review the LRA.

In the LRA, the applicant 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 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 (except for plant-specific SCs which require plant-specific review through onsite audit and program reviews addressed in the SER). 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.

1.2.2 Environmental Review

Part 51 of 10 CFR contains regulations on environmental protection. In December 1996, the staff revised the environmental protection regulations to facilitate the environmental review for license renewal. The staff prepared the 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.

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 public meetings on December 19, 2006, in the Coffey County Library, Burlington Branch located in 410 Juniatta Street, Burlington, KS 66839, to identify plant-specific environmental issues. The draft, plant-specific GEIS Supplement 32 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 November 8, 2007, in the same library, to discuss the draft, plant-specific GEIS Supplement 32. After considering comments on the draft, the staff published the final, plant-specific GEIS Supplement 32 separately from this report in May 2008.

1.3 Principal Review Matters and Purpose for the SER

Part 54 of 10 CFR 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, "Standards for Issuance of a Renewed License," of 10 CFR 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 applicant address "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license" in the LRA. On this issue, the applicant stated in the LRA:

> The current indemnity agreement for Wolf Creek states in Article VII that the agreement shall terminate at the time of expiration of that license specified in Item 3 of the Attachment to the agreement. Item 3 of the Attachment to the indemnity agreement, as amended, lists license number NPF-42. The Company requests that conforming changes be made to the indemnity agreement, and/or the Attachment to the agreement, as required, to ensure that the indemnity agreement continues to apply during both the terms of the current license and the terms of the renewed license. Applicant understands that no changes may be necessary for this purpose if the current license number is retained.

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

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 made during the staff's review of the LRA, (c) an evaluation of TLAAs, and (d) FSAR supplements. 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 USAR supplement. By letters dated, September 29, October 11, October 17, 2007, and April 1, 2008, the applicant submitted an LRA update which summarizes the CLB changes that have occurred during the staff's review of the LRA. This submission of an LRA update satisfies 10 CFR 54.21(b) requirements.

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 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 technical specification changes necessary for issuance of the renewed WCGS operating license. This statement adequately addresses the 10 CFR 54.22 requirement.

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

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

1.4 Relevant Interim Staff Guidance for the SER

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 Relevant 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.	SER Sections 3.0.3.3.1 and 3.0.3.3.2
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 PWRs

Note: Staff guidance on scoping of equipment relied on to meet the requirements of the station blackout rule for license renewal was incorporated in SRP-LR Section 2.5.2.1.1.

1.5 Summary of Open Items

As a result of its review of the LRA, including additional information submitted through December 7, 2007, the staff had identified the following open items (OIs) in the draft SER with open items which was issued on February 1, 2008. An item is considered open if, in the staff's judgement, it does not meet all applicable regulatory requirements or the staff has not finished its review. The staff had assigned a unique identifying number to each OI. As a result of the submittal of responses by the applicant for closure of OIs, the staff has reviewed these responses and found them all to be acceptable for closure of the OIs.

OI 2.5-1: (SER Section 2.5.1 - Scoping and Screening Results of Electrical Components)

Information provided by the applicant for equipment relied on to meet the requirements of the station blackout (SBO) rule (10 CFR 50.63) for license renewal (10 CFR 54.4.(a)(3)) is inconsistent with the staff review criteria. Hence, the applicant should include the circuits up to and including the switchyard circuit breakers used for SBO recovery within the scope of license renewal.

By letter dated March 29, 2008, the applicant revised the SBO recovery paths to include circuit breakers as the scoping boundary. Per teleconference call with the applicant on July 15, it was further clarified that the control cables for the associated control circuits and structures are within the scope of license renewal (this was confirmed by the applicant via e-mail on July 16, as requested). Thus, the change to the SBO recovery paths to include the complete path from the safety buses to circuit breakers at transmission voltage level resolves OI 2.5-1. OI 2.5-1 is closed.

OI 3.0.3.1.10-1: (SER Section 3.0.3.1.10 - Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program)

Information provided by the applicant for equipment relied on to meet the requirements of the SBO Rule (10 CFR 50.63) for license renewal (10 CFR 54.4(a)(3)) are inconsistent with the staff review criteria. Hence, the applicant should include the circuits up to and including the switchyard circuit breakers within the scope of license renewal, and managed by the AMP related to Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements.

In response to OI 3.0.3.1.10-1, the applicant submitted Amendment 6 (March 29, 2008) to the LRA to include the underground cables from circuit breaker 13-48 to disconnect switch 13-23 within the scope of inaccessible medium-voltage cable not subject to 10 CFR 50.49 EQ requirements AMP. The staff finds the applicant's response to OI 3.0.3.1.10-1 acceptable because the applicant has included the underground medium-voltage cables from circuit 13-48 to the disconnect switch 13-23 within the scope of license renewal, as appropriate.
OI 3.0.3.1.10-1 is closed.

OI 4.3: (SER Section 4.3.3 - ASME Code Section III, Subsection NG, Fatigue Analysis of Reactor Pressure Vessel Internals and Section 4.3.5 - Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in B31.1 and ASME Code Section III, Class 2 and 3 Piping)

The staff evaluation of LRA Sections 4.3.3 and 4.3.5 verified that the fatigue analyses were not projected for the period of extended operation. Initially, the analyses were not completed for the staff's review and; therefore, did not satisfy the requirements described in 10 CFR 54.21(c)(1)(ii).

By letter dated November 30, 2007, the applicant provided its assessment of the impact of high-cycle fatigue to the total fatigue usage factor for the reactor pressure vessel internals and the applicant addressed its assumed thermal cycle count for allowable secondary stress range reduction factor in B31.1 and ASME Code Section III, Class 2 and 3 piping. The staff's audit that was needed of the plant design and basis documents to verify the validity of the applicant's assessment was identified as OI 4.3.

The staff audited the applicant's calculation BB-S-029 Revision 0, titled "ASME Code Design Stress Report for Wolf Creek Generating Station Reactor Vessel Internals" and validation letter W LTR SAP 07-28. The staff, through its audit, verified that for some locations (representative), fatigue usage from high-cycle loadings (*e.g.*, flow-induced vibrations) was found to be negligible. This indicates that vibratory stresses were very small compared to thermal transient stresses and do not have a contributing effect in the fatigue cumulative usage factor (CUF) calculation. The staff finds the applicant's approach acceptable and concludes that the part of OI 4.3 which refers to the vessel internals (Section 4.3.3) is resolved.

In the letter dated November 30, 2007, the applicant claimed that based on further review of the original stress calculations for the reactor coolant sample lines (submitted as supplemental information), the calculations and related assumptions are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). The staff audited supporting analyses

J-SJ16-3, J-SJ16-4, and J-SJ03-1 and verified that, based on SRP-LR Table 4.3-1, a required Stress Range Reduction Factor of 0.9 is incorporated in the analyses. The staff concludes that the part of OI 4.3 which refers to the reactor coolant sample lines (Section 4.3.5) is resolved.

Based on the results of the staff's audit, OI 4.3 is closed.

OI 4.3-1: (SER Section 4.3.4 - Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190))

By letter dated September 4, 2007, the staff requested that the applicant:

(a) Clearly define 1D thermal (virtual) stresses for different locations on the component (nozzle, nozzle inner radius) and thermal conditions (stratification). In addition, explain how the 1D thermal stress is derived for the surge line hot leg nozzle under stratification.

(b) Explain what is the limitation of 1D virtual stress methodology and describe what kind of conditions cannot be mathematically proven to be conservative.

(c) Provide a justification that demonstrates ASME Code compliance using the 1D thermal (virtual) stress methodology.

In a letter dated October 3, 2007, the applicant provided its response to address 1D virtual stress related issues. In the response, the applicant stated that FatiguePro 1D stress analysis is demonstrably conservative for all load pairs that include significant transients. However, the staff noted that FatiguePro was used for another plant, which has demonstrated that 1D virtual stress method has limitations, and can generate inaccurately-low stress results. Therefore, the staff determined that the applicant did not provide sufficient information to address the concerns raised in the staff's follow-up questions to RAI 4.3-1. This was identified as OI 4.3-1.

By letters dated May 15, 2008 and June 9, 2008, the applicant provided a response and supplemental information for resolution of OI 4.3-1. The applicant provided the confirmatory analysis to validate its methodology used in earlier submittals.

This analysis is based on an assumption that is uncertain of the presence of the thermal sleeve in the charging nozzle. Because of this uncertain assumption and other reasons, the staff chose not to review this confirmatory analysis at this time. However, the staff noted that the applicant supplemented the response by letter dated June 9, 2008 and committed to validate the presence or absence of a charging nozzle thermal sleeve, and to perform a new analysis if a thermal sleeve is not present, as a part of the Fatigue Monitoring Program (i.e., Metal Fatigue of Reactor Coolant Pressure Boundary Aging Management Program). The staff finds this acceptable for resolution of OI 4.3-1 because the applicant committed to: (a) validate the configuration of the charging nozzles and perform the updated CUF calculations, as a part of Metal Fatigue of the Reactor Coolant Pressure Boundary AMP and (b) adjust the CUF values in the components' stress calculations for the NUREG/CR-6260 locations by the environmental F_{en} factors as appropriate. Based on this determination, the staff concludes that aging management of environmentally-assisted metal fatigue for the charging nozzles is acceptable in accordance with 10 CFR 54.21 (c)(1)(iii). OI 4.3-1 is closed.

OI 4.3-3: (SER Sections 4.3.2.7 - ASME Code Section III, Class 1 Piping and Piping Nozzles and Section 4.3.4 - Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190))

By letter dated September 4, 2007, the staff questioned the applicant's methodology used to calculate the baseline fatigue usage factors for the surge line hot leg nozzle, charging nozzle, and alternate charging nozzle locations.

In its response dated October 3, 2007, the applicant committed (Commitment No. 38) to address the backward projection for the surge line hot leg nozzle, charging nozzles, and alternate charging nozzles by January 31, 2008. The applicant committed to calculate an updated baseline fatigue usage factor that adequately bounds transients experienced before the monitoring of CUFs was started. The existing baseline CUF for all monitored locations will be increased to bound the potential CUF contribution from the transients that were under-represented in the existing baseline. This was identified as OI 4.3-3.

By letters dated January 25, 2008, the applicant provided a response to OI 4.3-3. The staff found the applicant's methodology and process for performing a revised CUF analysis of the pressurizer spray nozzle, pressurizer lower head and heater penetration, pressurizer surge nozzle, surge line piping, and steam generator feedwater nozzles to be acceptable for aging management of metal fatigue of these components, because the applicant appropriately: (a) accounted for transients that occurred in "Period 1" prior to the monitoring of CUF (including those transients that were not accounted for and those transients whose cycles were improperly counted) and (b) computed the revised baseline CUFs for these components based on the updated transient information. However, the staff's review of additional information on the reanalyses for the surge line hot leg nozzle and charging nozzles was needed because the applicant in its reassessment, did not account for the additional insurge/outsurge cycles from the pre-MOP (Modified Operating Procedure) environment, nor the differential contribution from each category of charging events.

The applicant submitted supplemental information on May 15, 2008 and June 9, 2008 for closure of OI 4.3-3. The staff finds the submittal to be an acceptable basis for managing the impacts of metal fatigue on the pressure boundary function of the surge line hot leg nozzle and charging nozzles because the applicant committed to updating of: (a) the baseline for the pressurizer hot leg nozzle based on the actual pre-MOP environment and (b) the fatigue monitoring program baseline for the charging nozzles with consideration for differential contribution of fatigue for each category of charging event. In addition, relative to the presence of the thermal sleeve with the charging nozzles, the applicant committed to: (a) confirm that either the design of the charging nozzles includes thermal sleeves and if not, (b) account for the lack of thermal sleeves in the reanalysis of the charging nozzles. This commitment is also a part of the performance of a CUF calculation update.

The staff concludes that the applicant has provided an acceptable basis for accepting the aging management of TLAA related metal fatigue of the components in accordance with 10 CFR 54.21(c)(1)(iii). OI 4.3-3 is closed.

1.6 Summary of Confirmatory Items

As a result of its review of the LRA, including additional information submitted to the staff through December 7, 2007, the staff determined that no confirmatory items exist which would require a formal response from the applicant as a part of the RAI process and to be captured in the SER with OIs. The remaining OIs were addressed subsequently as a part of the closure of OIs in the SER.

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 USAR supplement required by 10 CFR 54.21(d) in the next USAR update required by 10 CFR 50.71(e), following the issuance of the renewed license.

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

The third 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 insertion and withdrawal schedule, including use of 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.

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, "Contents of Application Technical Information," of the *Code of Federal Regulations* (10 CFR Part 54.21), requires for each license renewal application (LRA) an integrated plant assessment (IPA) listing structures and components (SCs) subject to an aging management review (AMR), as documented in SER Section 1.2.1, from all of the systems, structures, and components (SSCs) within the scope of license renewal.

LRA Section 2.1, "Scoping and Screening Methodology," describes the methodology for identifying SSCs at the Wolf Creek Generating Station (WCGS), Unit 1, within the scope of license renewal and SCs subject to an AMR. The staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) reviewed the Wolf Creek Nuclear Operating Corporation (WCNOC or the applicant) scoping and screening methodology to determine whether it meets the scoping requirements of 10 CFR 54.4(a) and the screening requirements of 10 CFR 54.21.

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

2.1.2 Summary of Technical Information in the Application

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

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

LRA Section 3, "Aging Management Review Results," provides the applicant's aging management results listed in the following LRA sub-sections:

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

LRA Section 4, "Time-Limited Aging Analyses," states the applicant's time-limited aging analyses.

2.1.3 Scoping and Screening Program Review

The staff evaluated the LRA scoping and screening methodology in accordance with the guidance in Section 2.1, "Scoping and Screening Methodology," of NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants" (SRP-LR), dated September 2005. The following regulations form the basis for the acceptance criteria for the scoping and screening methodology review:

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

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

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

The staff conducted an onsite scoping and screening methodology audit during the week of January 8, 2007. The audit focused on whether the applicant had developed and implemented adequate guidance for the scoping and screening of SSCs by the methodologies in the LRA and the requirements of the Rule. The staff reviewed implementation of the scoping and screening methodology described in the applicant's license renewal project instruction and technical position papers. The staff discussed with the applicant details of the implementation and control of the license renewal program and reviewed administrative control documentation and selected design documentation used by the applicant during the scoping and screening process. The staff reviewed the applicant's processes for quality assurance (QA) for development of the LRA. The staff reviewed the quality attributes of the applicant's aging management program (AMP) activities described in LRA Appendix A, "Updated Safety Analysis Report Supplement," and LRA Appendix B, "Aging Management Programs" (as documented in SER Section 1.2.1) and the training and qualification of the LRA development team. The staff reviewed scoping and screening results reports for the auxiliary feedwater and high pressure coolant injection systems and the auxiliary building structure for the applicant's appropriate implementation of the methodology outlined in the administrative controls and for results consistent with the current licensing basis (CLB) documentation.

2.1.3.1 Implementation Procedures and Documentation Sources for Scoping and Screening

The staff reviewed the applicant's scoping and screening implementation procedures as documented in the audit report dated March 21, 2007, to verify whether the process for identifying SCs subject to an AMR was consistent with the LRA and the SRP-LR. Additionally, the staff reviewed the scope of CLB documentation sources and the applicant's process for appropriate consideration of CLB commitments and for adequate implementation of the procedural guidance during the scoping and screening process.

2.1.3.1.1 Summary of Technical Information in the Application

In LRA Section 2.1.1.1, the applicant addressed the following information sources for the license renewal scoping and screening process:

- current licensing basis documents
- maintenance rule database
- engineering drawings
- technical position papers
- master equipment list and Q-List

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

2.1.3.1.2 Staff Evaluation

Scoping and Screening Implementation Procedures. The staff reviewed the applicant's scoping and screening methodology implementation procedures, including license renewal project instruction for scoping and screening of SSCs, technical position papers, AMR reports, license renewal drawings, and other reference documents 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, "Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," Revision 6, (NEI 95-10, which was endorsed by NRC as documented in the SER Section 1.2.1).

The staff finds that the overall process for implementing 10 CFR Part 54 requirements included in the license renewal project instruction, position papers, and AMRs is consistent with the Rule and industry guidance endorsed by the NRC. The staff found guidance for identifying plant SSCs within the scope of license renewal (including guidelines for identifying SC component types that are subject to an AMR) in the position papers. The staff's review of the applicant's procedures focused on the consistency of the detailed procedural guidance with relevant information in the LRA which reflects implementation of the staff position (as documented in the SRP-LR).

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

Sources of Current Licensing Basis Information. For WCGS, system safety functions are stated in the Updated Safety Analysis Report (USAR), technical specifications, safety evaluation reports, the maintenance rule database, and design basis documents (DBDs). The staff considered the safety objectives in the USAR system descriptions and identified objectives meeting the safety-related requirements of 10 CFR 54.4(a)(1).

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

During the audit, the staff reviewed the applicant's CLB information sources, and samples of such information, including the USAR, DBDs, technical position papers, maintenance rule information, and license renewal drawings that were utilized when determining whether an SSC is within the scope of license renewal pursuant to 10 CFR 54.4(a)(1), (a)(2) and (a)(3). The applicant's license renewal project instruction specifies the use of CLB references for scoping determination, and primary sources of CLB which include the USAR, site technical specifications, safety evaluation reports, and NRC orders. Other reference documents that were used in the scoping determination include the plant equipment list, maintenance rule database, and technical position papers. The applicant's project instruction states that the reference documents or databases which are not official CLB documents may be used for scoping determination; however, their scoping information was confirmed with references to CLB documents.

In addition, the staff reviewed the applicant's position papers used to support identification of SSCs relied upon to demonstrate compliance with the nonsafety-related criteria delineated in 10 CFR 54.4(a)(2) and the five regulated events referenced in 10 CFR 54.4(a)(3). The intended functions for 10 CFR 54.4(a)(1) reference the appropriate USAR section. The position papers identify the WCGS systems and structures that comply with 10 CFR 54.4(a)(2) and (a)(3). The applicant's license renewal project instruction and position papers provide 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 scope of SSCs identified by the applicant is consistent with the plant's CLB. The staff determines that LRA Section 2.1 provides 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.

The staff finds the overall process for implementing 10 CFR Part 54 requirements described in the applicant's project instructions, technical position papers, and AMRs is consistent with the Rule and industry guidance (endorsed by NRC as documented in SER Section 1.2.1).

2.1.3.1.3 Conclusion

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

2.1.3.2 Quality Controls Applied to LRA Development

2.1.3.2.1 Staff Evaluation

The staff reviewed the quality controls used by the applicant to ensure that scoping and screening methodologies used in the LRA were adequately implemented. The staff observed that the applicant developed the LRA with deviation from a 10 CFR Part 50, Appendix B, QA program. The applicant applied the following QA processes during the LRA development:

- The scoping and screening methodology was governed by written procedures, guidelines and position papers.
- The information entered into the license renewal database was controlled by written procedures and guidelines and reviewed and approved by management.
- All scoping and screening packages were controlled by written procedures and guidelines, reviewed by the responsible engineers and approved by the discipline lead and the license renewal project manager.
- The LRA was reviewed by the Site Review Committee, WCGS management and legal counsel, and system engineers and subject matter experts prior to submittal to the NRC.
- The LRA received a peer review.
- The applicant conducted assessments, performed independent reviews, and documented lessons learned to verify that the LRA was developed in accordance with the requirements of 10 CFR 54.4.

2.1.3.2.2 Conclusion

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

2.1.3.3 Training

2.1.3.3.1 Staff Evaluation

The staff reviewed the applicant's training process for consistent and appropriate guidelines and methodology for the scoping and screening activities.

The training consisted of a combination of reading (self-study), discussions with experts, and attending training sessions. The indoctrination records specified the level of training which was required for the various groups participating in the development of the LRA and began with an orientation session, as documented on personnel's indoctrination record. The training was required for both the Center of Business (COB) license renewal project personnel who prepared the application and for the site personnel who reviewed the application. In addition, annual COB plant aging management training was provided for the COB license renewal project personnel. This training included information on the license renewal process and information specific to the site. License renewal project and site personnel were required to review applicable license renewal regulations and guidance documents, NEI 95-10, and associated procedures.

The staff reviewed representative samples of the training documentation for both the COB and the site license renewal project personnel, including new employees and utility representatives. Additionally, after discussions with COB and the applicant's license renewal personnel during the audit, the staff verified that the COB and the site license renewal project personnel were knowledgeable of the license renewal process requirements and the specific technical issues within their areas of responsibility. The staff has no adverse findings.

2.1.3.3.2 Conclusion

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

2.1.3.4 Conclusion of Scoping and Screening Program Review

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

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

LRA Section 2.1.3, describes the methodology for scoping SSCs pursuant to 10 CFR 54.4(a) and the plant scoping process for systems and structures.

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 and identifying their intended functions. Intended functions are those functions that are the basis for including a system or structure within the scope of license renewal (as defined in 10 CFR 54.4(b)) and are identified by comparing the system or structure function with the criteria in 10 CFR 54.4(a). The systems list was developed from the WCGS maintenance rule scoping results, and the structures list from a review of site drawings in conjunction with walkdowns. Finally, the applicant evaluated the components in the systems and structures that were within the scope of license renewal. The applicant marked the system and/or structure boundary of SCs that are within the scope of license renewal and that are subject to an AMR in colors on the license renewal drawings. The applicant's scoping methodology, as described in the LRA, is discussed in the sections below.

Additionally, to help facilitate the identification of SSCs within the scope of license renewal pursuant to 10 CFR 54.4(a), the applicant developed a license renewal data management tool (LRDMT), or the "license renewal database." The LRDMT contained detailed design description information about each plant system and structure and the relevant functions of those systems and structures. By using the LRDMT, the applicant performed scoping of the systems and structures. The applicant's scoping process consisted of developing a list of plant systems and structures by using maintenance rule documentation. Each system or structure was assigned a unique license renewal identification number. After developing a list of systems and structures, the applicant performed a scoping evaluation was performed which included: identification of the system and/or structure purpose and functions, comparison of all the functions against the requirements of 10 CFR 54.4(a)(1), (a)(2) and (a)(3), and identification of intended function(s) based on its (system) performing or supporting a safety-related function, identification of support systems, determination of the system evaluation boundary, creation of license renewal drawings, component level scoping, and final documentation of scoping results including references.

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

2.1.4.1.1 Summary of Technical Information in the Application

LRA Section 2.1.2.1 describes the scoping requirements associated with safety-related criteria in accordance with 10 CFR 54.4(a)(1). Safety-related classifications for systems and structures are reported in the USAR or in DBDs, such as engineering drawings, evaluations, or calculations. The safety-related classifications for components are documented on engineering drawings and in the Q-List. The safety-related classification as reported in these source documents is relied upon to identify SSCs satisfying one or more of the criteria of 10 CFR 54.4(a)(1). These SSCs have been identified as within the scope of license renewal.

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 (1) the integrity of the reactor coolant pressure boundary, (2) the ability to shut down the reactor and maintain it in a safe shutdown condition, or (3) the ability to prevent or mitigate the consequences of accidents that could cause offsite exposures comparable to those of 10 CFR 50.34(a)(1), 50.67(b)(2), or 100.11.

With regard to identification of DBEs, SRP-LR Section 2.1.3, "Review Procedures," states:

> The set of DBEs as defined in the Rule is not limited to Chapter 15 (or equivalent) of the USAR. 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 USAR, 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, through discussions with the WCGS license renewal project personnel, the staff verified that the USAR was reviewed to identify SSCs that are 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). Relevant anticipated operational occurrences and postulated accidents described in USAR Chapter 15 were reviewed to identify SSCs and their associated functions as described in 10 CFR 54.4(a)(3). Associated USAR Chapters 1 through 12 were reviewed to identify SSCs that are relied upon to remain functional during and after DBEs for which the facility was designed to ensure that the functions described in 10 CFR 54.4(a)(1) are successfully accomplished.

Additionally, consistent with the definition of DBE described in 10 CFR 50.49(b)(1)(ii), plant conditions including normal operation, abnormal operational transients, design basis accidents, internal and external events, and natural phenomena for which the plant must be designed were considered for the license renewal pursuant to the 10 CFR 54.4(a)(1) criteria. Also during the audit, the applicant stated that the review included: (1) seismic design classification; (2) external events such as ice effects, floods, earthquakes, tornado and wind loading; (3) internal events such as high energy line breaks, flooding, missile protection, fires; and (4) regulated events such as anticipated transient without scram (ATWS), station blackout (SBO), and fire protection. The applicant further stated that in addition to the USAR, other CLB sources such as the NRC regulations, safety evaluation reports (SERs), and documents referenced by the USAR were considered. Examples of the consideration of other CLB sources are noted in the WCGS position papers for the regulated events.

The applicant performed scoping of SSCs pursuant to 10 CFR 54.4(a)(1) in accordance with the license renewal project instructions which provided guidance for the preparation, review, verification, and approval of the scoping evaluations to assure the adequacy of the results of the scoping process. The staff reviewed these guidance documents governing the applicant's evaluation of safety-related SSCs, and sampled the applicant's scoping results reports to ensure the methodology was implemented in accordance with the written project instructions. In addition, during the audit, the staff discussed the methodology and the results with the applicant's personnel who were responsible for these evaluations.

Specifically, the staff reviewed a sample of the license renewal scoping results for the auxiliary feedwater and high pressure coolant injection systems and the auxiliary building structure to gain assurance that the applicant adequately implemented its scoping methodology in accordance with 10 CFR 54.4(a)(1). The staff verified that the scoping results for each of the sampled systems and the structure were developed in a manner that was consistent with the methodology such that (a) the SSCs credited for performing intended functions were identified, and (b) the basis for the results as well as the intended functions were adequately described. The staff verified that the applicant identified and used pertinent engineering and licensing information to identify the SSCs required to be within the scope of license renewal in accordance with 10 CFR 54.4(a)(1).

The staff's review of LRA Section 2.1.2.1 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening methodology. The applicant responded to the staff's request for additional information (RAI) as discussed below.

During the staff's review, the staff noted that source documents, such as USAR Section 3.2, and procedures AP 05-007, Section 6.1.4, and AP 23M-001, Section 4.17.1, have differing definitions for the term safety-related. In addition, these documents cited, at the time, superseded regulatory text for establishing the scoping criteria to be used in identifying SSCs in accordance with the requirements of 10 CFR 54.4(a)(1).

In RAI 2.1-1 dated April 4, 2007, the staff requested that the applicant address the impact, if any, due to the use of various definitions of safety-related. In addition, the staff requested that the applicant address the impact of not having considered these different definitions in its scoping methodology for those SSCs that are relied upon to ensure "the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines in 10 CFR Sections 50.34(a)(1), 50.67(b)(2), or 100.11 of this chapter, as applicable" (consistent with the facility's CLB for safety-related SSCs and 10 CFR 54.4(a)(1)(iii)).

In its response dated May 2, 2007, the applicant stated:

> The term 'safety related' is defined in WCGS USAR Section 3.2 (Classification of Structures Components and Systems), procedure, AP 23M-001, 'Maintenance Rule Program,' and procedure, AP 05-007, 'Determination of Safety Classification,' and WCGS LRA Section 2.1.2.1. The definition provided in LRA Section 2.1.2.1 is consistent with 10 CFR 54.4(a)(1).
>
> - Design Basis Events are considered in the definition of safety-related in procedure AP 05-007, Section 6.1.4, and AP 23M-001, Section 6.1.1.1.a, which is consistent with 10 CFR 54.4(a)(1).
>
> - USAR Section 3.2 a and b, procedure AP 05-007, Sections 6.1.4 (1) and (2), and AP 23M-001, Sections 6.1.1.1.a.1 and 2 require integrity of reactor coolant pressure boundary and capability to shutdown the reactor and maintain it in a safe shutdown condition consistent with 10 CFR 54.4(a)(1)(i) and (ii).

- USAR Section 3.2 c, procedure AP 05-007, Section 6.1.4 (3), and AP 23M-001, Section 6.1.1.1.a.3 definitions refer to capability to prevent or mitigate accidents that could result in potential offsite exposure comparable to the guidelines in 10 CFR 100 which is consistent with the definition in 10 CFR 54.4(a)(1)(iii). WCGS has not revised the current accident source term in accordance with 10 CFR 50.67 and therefore the reference to 10 CFR 50.67(b)(1) as stated in 10 CFR 54.4(a)(1)(iii) is not applicable to WCGS. The reference to 10 CFR 50.34(a)(1) as stated in 10 CFR 54.4(a)(1)(iii) is intended for applicants for a construction permit, a design certification or combined license pursuant to 10 CFR 52.

The applicant further stated that site specific definitions for safety-related in the USAR and referenced plant programs discussed above are consistent with the definition of safety-related provided in 10 CFR 54.4(a)(1) as referenced in LRA Section 2.1.2.1.

Based on its review, the staff finds the applicant's response to RAI 2.1-1 acceptable because the site specific definitions for the term safety-related in the source documents meets the requirements of 10 CFR 54.4(1). In addition, the applicant explained why the requirements of 10 CFR 50.67 and 50.34(a)(1) are not applicable to WCGS. The staff's concern described in RAI 2.1-1 is resolved.

2.1.4.1.3 Conclusion

Based on its review and discussions with the applicant, the staff determines that the applicant's methodology for identifying systems and structures meets the requirements of 10 CFR 54.4(a)(1) and, therefore, is acceptable.

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

2.1.4.2.1 Summary of Technical Information in the Application

LRA Section 2.1.2.2 describes the scoping methodology (application of Scoping Criteria in 10 CFR 54.4(a)(2)) as it relates to the nonsafety-related criterion described in 10 CFR 54.4(a)(2). The applicant evaluated the SSCs that met the requirements of 10 CFR 54.4(a)(2) using the following three categories.

<u>Initial Nonsafety-Related SSCs Required to Support Safety-Related SSCs</u>. The nonsafety-related systems or structures credited with supporting satisfactory accomplishment of a safety-related function were classified as satisfying the requirements of 10 CFR 54.4(a)(2) and were included within the scope of license renewal. The applicant reviewed the USAR and other CLB documents for every nonsafety-related plant system and structure to determine whether the system or structure was credited with supporting satisfactory accomplishment of a safety-related function.

<u>Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs</u>. Nonsafety-related mechanical SSCs that are directly connected to safety-related SSCs were included within the scope of license renewal, where possible, up to the first seismic anchor past the nonsafety-related and safety-related interface. These nonsafety-related components are

required to maintain mechanical and structural integrity to provide structural support to the attached safety-related piping and components. In cases where seismic anchors were not available to serve as the license renewal boundary (for structural integrity), the applicant used other methods, as described in the guidance provided in NEI 95-10, to establish the license renewal boundary. These methods included the use of an equivalent anchor. An equivalent anchor was defined as a combination of restraints or supports such that the nonsafety-related piping and associated SCs attached to safety-related piping is included within the scope of license renewal up to a boundary point that includes two supports in each of the three orthogonal directions. Other methods included extending the license renewal boundary to a base-mounted component that is rugged and designed not to impose loads on connected piping, or including the entire run of nonsafety-related piping that is connected at both ends to safety-related piping.

Nonsafety-Related Systems with Spatial Interaction with Safety-Related SSCs. Nonsafety-related SSCs which are not connected to safety-related piping or which are not required for structural integrity, but have a spatial relationship such that their failure could adversely impact the performance of a safety-related SSC intended function, were included within the scope of license renewal. The applicant considered pipe whip, jet impingement, flooding, spray, and physical impact when evaluating the potential for spatial interaction between nonsafety-related and safety-related SSCs.

The applicant considered all safety-related structures as potential locations for safety-related and nonsafety-related interactions that could result in an intended function for spatial interaction. The list of all safety-related structures was divided into two groups for further evaluation. The first group identified was composed of safety-related structures that were expected to not have nonsafety-related fluid-filled systems or components. These structures were then confirmed to not contain nonsafety-related fluid-filled systems or components by walkdowns and reference to other sources, both electronic and otherwise, of equipment location information. The second group was composed of those structures that were expected to contain nonsafety-related fluid-filled components that have spatial interaction, for which their failure could adversely impact the performance of a safety-related SSC intended function (included within the scope of license renewal). For those safety-related structures determined to contain nonsafety-related fluid-filled systems, further evaluations were performed.

2.1.4.2.2 Staff Evaluation

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

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

NEI 95-10 states that applicants should not consider hypothetical failures that could result from system interdependencies that are not part of the CLB, but rather base their evaluation on the plant's CLB, engineering judgement and analyses, and relevant operating experience, describing operating experience as all documented plant-specific and industry-wide experience useful in determining the plausibility of a failure. Documentation would include NRC generic communications and event reports, plant-specific condition reports, industry reports, safety operational event reports, and engineering evaluations.

The staff reviewed LRA Section 2.1.2.2. In the LRA, the applicant described the scoping methodology as it relates to the nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2). The applicant evaluated the SSCs that met the requirements of 10 CFR 54.4(a)(2) using three categories. In addition, the staff reviewed the applicant's license renewal position paper for 10 CFR 54.4(a)(2), which describes the AMR (for additional information) of nonsafety-related mechanical systems considered to satisfy 10 CFR 54.4(a)(2) for both structural integrity and spatial interaction issues. The applicant's evaluation was performed in accordance with the guidance contained in NEI 95-10, Revision 6, for the identification and the treatment of SSCs which met 10 CFR 54.4(a)(2).

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

(1) Nonsafety-Related SSCs Required for Functions that Support Safety-Related SSCs - The applicant reviewed CLB documents to determine if the failure of any nonsafety-related SSCs could prevent satisfactory accomplishment of any of the three safety-related functions listed in 10 CFR 54.4(a)(1). Nonsafety-related systems or structures explicitly credited in CLB documents with supporting the accomplishment of a safety-related function were classified as satisfying the 10 CFR 54.4(a)(2) criteria and were included within the scope of license renewal. This evaluation criterion was discussed in the applicant's project instruction for scoping and screening. 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.

(2) Nonsafety-Related Systems Connected to and Structurally Supporting Safety-Related SSCs - For nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems), the applicant included the nonsafety-related piping and supports, up to and including the first seismic or equivalent anchor beyond the safety-related and nonsafety-related interface within the scope of license renewal for structural integrity in accordance with 10 CFR 54.4(a)(2). A seismic anchor was defined by the applicant as a device or structure that ensures that forces and moments are restrained in three orthogonal directions. The applicant stated that in approximately 95 percent of the cases at WCGS, an actual seismic anchor existed and served as the license renewal boundary for the nonsafety-related structural integrity feature. In cases where a seismic anchor did not exist, the applicant extended the license renewal boundary to an equivalent anchor. At WCGS, an equivalent anchor was defined as a boundary point (linear piping)

that includes two supports in each of three orthogonal directions. When neither a seismic nor equivalent anchor existed, the applicant extended the license renewal boundary to:

- a base-mounted component (e.g., pump, heat exchanger, tank, etc.) that is a rugged component and is designed not to impose loads on connecting piping
- include the entire run of nonsafety-related piping that is connected at both ends to safety-related piping
- a flexible connection when the flexible connection effectively decouples the piping system (i.e, does not support loads or transfer loads across it to connecting piping), or
- a free end of nonsafety-related piping, (e.g., a drain pipe that ends at an open floor drain)

The above alternative methods are in accordance with the industry's guidance described in NEI 95-10, Appendix F endorsed by NRC.

(3) Nonsafety-Related SSCs Not Directly Connected to Safety-Related SSCs - The applicant considered pipe whip, jet impingement, flooding, spray, and physical impact when evaluating the potential for spatial interaction between nonsafety-related SSCs and safety-related SSCs. The applicant also applied the guidance in NEI 95-10, Appendix F. However, the LRA did not clearly indicate how the nonsafety-related SSCs for this particular category were scoped.

The staff's review of LRA Section 2.1.2.2 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.1-2 dated April 4, 2007, the staff requested that the applicant address the following:

(1) explain which option was used for the evaluation of nonsafety-related SSCs not directly connected to safety-related SSCs, and describe the process for scoping portions of nonsafety-related systems in rooms or building, level, or areas (BLA) that contain safety-related components

(2) define how a "room" or BLA is used (applied) in the determination of the location of safety-related equipment, and ultimately how portions of nonsafety-related systems were scoped for spatial interaction

(3) describe how the effects of a pipe break in a room (that may not contain a safety-related component) were evaluated for interaction with an adjacent room that contains safety-related components

(4) the technical justification and extent of condition for the exclusion of piping systems containing an insignificant amount of liquid that would not typically be replenished from the scope of license renewal

(5) the technical justification and extent of condition for the exclusion of the roof drain piping that passes through the portions of the above buildings where safety-related equipment is located

In its response dated May 2, 2007, the applicant stated the following:

(1) With regard to which option was used for the evaluation of nonsafety-related SSCs not directly connected to safety-related SSCs, the applicant stated that in accordance with NEI 95-10, Revision 6, it used the preventive option. The applicant further stated that all fluid-filled nonsafety-related components in a room or BLA are considered to be within the scope of license renewal for 10 CFR 54.4(a)(2) spatial interaction considerations if the room or BLA contains any safety-related components. Rooms or BLAs containing fluid-filled nonsafety-related components were excluded from consideration only if there were determined to be documented fire zone barriers such that the fluid-filled nonsafety-related components were isolated from any safety-related components. The applicant concluded that this consideration accounts for any potential room to room communication concerns.

    Based on its review, the staff finds the applicant's response acceptable because the applicant clarified which option was used for the evaluation of nonsafety-related SSCs not directly connected to safety-related SSCs, and that methodology is consistent with the guidance in NEI 95-10, Revision 6. Furthermore, the applicant explained that all fluid-filled nonsafety-related components in a room or BLA are within the scope of license renewal for spatial interaction considerations if the room or BLA contains any safety-related components.

(2) With regard to how the applicant defined a "room" or BLA, the applicant stated that a room is a location shown on the plant drawings with a four digit identifier. A room may be completely enclosed and isolated (separated) from other locations to the extent that it includes its own fire zone, or it may be a largely open area with access to other rooms. A BLA is a three digit code representing the building, level, and area for a plant location, and could comprise more than one room. All fluid-filled nonsafety-related components in a room or BLA are considered to be within the scope of license renewal for 10 CFR 54.4(a)(2) spatial interaction considerations if the room or BLA contains any safety-related components.

    Based on its review, the staff finds the applicant's response acceptable because the applicant clarified how the rooms and BLAs are identified, and further explained that all fluid-filled nonsafety-related components in a room or BLA are within the scope of license renewal for spatial interaction considerations if the room or BLA contains any safety-related components.

(3) With regard to communication between adjacent rooms, the applicant stated that plant locations excluded from consideration for spatial interaction (relative to interaction with adjacent rooms) were evaluated for potential communication with other rooms. Between the auxiliary, control, and fuel buildings, fewer than two

dozen locations were excluded. A majority of these locations were excluded because they are isolated (separated) from any safety-related components by fire zone boundaries, or because the fluid-filled nonsafety-related components were placed within the scope of license renewal for spatial interaction. For the remaining locations in question, the applicant stated that instead of providing justification for location exclusion, the nonsafety-related fluid-filled components will be included within the scope of license renewal for spatial interaction.

Based on its review, the staff finds the applicant's response acceptable because the applicant provided adequate justification for the location exclusion (of certain areas). In addition, by letter dated August 31, 2007, the applicant amended the LRA to include the nonsafety-related fluid-filled components in the remaining areas within the scope of license renewal.

(4) With regard to the exclusion of portions of piping systems containing an insignificant amount of liquid that would not typically be replenished, the applicant stated that portions of small isolated drain lines between a shut valve and a cap were not considered to be fluid-filled. This was justified by the insignificant amount of liquid that would be contained in these configurations, and that the amount is not sufficient to cause aging of mechanical or structural components. The applicant stated that electrical components are installed in metal enclosures with the cable entry into the electrical equipment sealed or installed within conduit, and as such would be unaffected by any atmospheric pressure leakage from the small isolated segments.

During a telephone conference dated May 15, 2007, the staff noted that the applicant's response to this RAI required clarification because an adequate justification regarding the exclusion of portions of piping systems containing an insignificant amount of liquid was not provided. The staff requested that the applicant clarify:

(a) if the location of the drain pipe was verified

(b) if the location of the electrical equipment in the vicinity of the drain pipes, which may be susceptible to leakage was verified, and

(c) how WCGS verified that the electrical equipment would not be affected by leakage from the drain pipes (e.g., is the equipment designed for a potentially wet environment.)

In its response dated July 26, 2007, the applicant stated that the drain pipes in question will be added within the scope of license renewal. By letter dated August 31, 2007, the applicant amended the LRA to include these drain pipes within the scope of license renewal.

Based on its review, the staff finds the applicant's response acceptable. The LRA has been adequately amended to include the drain pipes in question within the scope of license renewal.

(5) With regard to roof drains passing through rooms or areas containing safety-related equipment, the applicant stated that the roof drains will be added to the scope of license renewal. By letter dated August 31, 2007, the applicant amended the LRA to include these roof drains within the scope of license renewal.

Based on its review, the staff finds the applicant's response acceptable because the applicant adequately included the roof drains that pass through rooms and areas containing safety-related equipment within the scope of license renewal. The staff's concern described in RAI 2.1-2 is resolved.

2.1.4.2.3 Conclusion

Based on its review, discussions with the applicant, and consideration of the LRA amendment, the staff determines that the applicant's methodology for identifying systems and structures meets the requirements of 10 CFR 54.4(a)(2) and, therefore, is 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

In LRA Section 2.1.2.3, the applicant described the methodology for identifying systems and structures that are within the scope of license renewal. Section 54.4(a)(3) of 10 CFR requires including all SSCs relied on in safety analyses or plant evaluations that perform a function demonstrating compliance with the regulations for fire protection (10 CFR 50.48), environmental qualification (EQ) (10 CFR 50.49), pressurized thermal shock (PTS) (10 CFR 50.61), ATWS (10 CFR 50.62), and SBO (10 CFR 50.63), to be within the scope of license renewal review. Technical position papers were prepared by the applicant to provide input to the SSC scoping process. The purpose of these position papers was to evaluate the CLB relative to the regulated events, identify the systems and structures that are relied upon to demonstrate compliance with each of these regulations, and document the results of this review. Guidance provided by the technical position papers was used during system and structure scoping to identify system and structure intended functions for 10 CFR 54.4(a)(3), and again during component scoping as necessary to determine which components are credited in the regulated events. SSCs credited in the regulated events were determined to satisfy the requirements of 10 CFR 54.4(a)(3) and were included within the scope of license renewal.

Fire Protection. Section 54.4(a)(3) of 10 CFR requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for fire protection. The LRA states that fire protection for the purposes of license renewal was an inclusive term to describe a station's ability to minimize the adverse effects of fires on SSCs important to safety. The LRA states that the applicant developed a position paper which summarizes and documents the results of a detailed review performed on the fire protection program documents demonstrating compliance with the requirements of 10 CFR 50.48 for the plant. The position paper provided a list of systems and structures credited in the fire protection program documents. All SSCs classified as satisfying 10 CFR 54.4(a)(3) related to fire protection were identified as within the scope of license renewal.

Environmental Qualification. The LRA states that 10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for EQ. The WCGS EQ program applies to electrical equipment important to safety that is located in a harsh environment. USAR, Table 3.11(B)-3, was used as the basis to create a list of qualified systems. The LRA states that the applicant developed an EQ position paper that provides lists of systems that include EQ components. All components within the scope of the EQ program which demonstrate compliance with 10 CFR 50.49, and the systems containing those components in pursuant to the requirements of 10 CFR 54.4(a)(3) were identified by the applicant as within the scope of license renewal.

Pressurized Thermal Shock. The LRA states that 10 CFR 54.4(a)(3) requires that plant SSCs within the scope of license renewal include all SSCs relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the regulations for PTS. The LRA states that the applicant developed a position paper to document the review of the licensing basis for PTS at WCGS. The applicant determined that the only component within the scope of the license renewal rule for PTS is the reactor pressure vessel.

Anticipated Transient Without Scram. The LRA lists the equipment required for reduction of risk from an ATWS event at WCGS. The ATWS equipment was described in USAR Section 7.7.1.11, and the accident analysis for ATWS is discussed in USAR Section 15.8. The LRA states that all ATWS SSCs were included within the scope of license renewal.

Station Blackout. The LRA states that the equipment needed to cope with and recover from an SBO is identified in the WCGS Coping Assessment and is included in USAR Appendix 8.3A. The plant system portion of the offsite power system is within the scope of license renewal. The applicant created a technical position paper to summarize the results of a detailed review of the SBO documentation for WCGS. The position paper identified the SSCs credited with coping and recovering from an SBO. The SSCs identified in the SBO technical position paper were used in scoping evaluations to identify SSCs that demonstrate compliance with 10 CFR 50.63. All SSCs classified as satisfying the requirements of 10 CFR 54.4(a)(3) related to an SBO were identified by the applicant and included within the scope of license renewal.

2.1.4.3.2 Staff Evaluation

Fire Protection. The staff reviewed USAR Section 9.5.1, the Fire Hazards Analysis, the fire protection position paper and selected results of the applicant's fire protection review. The staff confirmed that the applicant developed a position paper which summarizes and documents the results of a detailed review performed on the fire protection program documents demonstrating compliance with the requirements of 10 CFR 50.48. The applicant reviewed the applicable CLB sources such as the USAR and developed a list of the required equipment for the event and any applicable recovery path. The position paper provides a list of systems and structures credited in the fire protection program documents and the applicable CLB sources. All SSCs classified as satisfying 10 CFR 54.4(a)(3) requirements related to fire protection were identified as within the scope of license renewal. Based on the staff's review, the staff concludes that the applicant's method for identifying SSCs within the scope of license renewal that satisfy the fire protection requirement of 10 CFR 54.4(a)(3) is adequate.

Environmental Qualification. The staff reviewed USAR Table 3.11(B)-3, the EQ position paper, and selected results of the applicant's EQ review. The staff confirmed that USAR Table 3.11(B)-3 was used as the basis to create a list of SSCs within the scope of license renewal. The applicant developed an EQ position paper that lists all systems that include EQ components. All components within the scope of the EQ program that demonstrate compliance with 10 CFR 50.49, and the systems containing those components which met the requirements of 10 CFR 54.4(a)(3), were included within the scope of license renewal. Based on the staff's review, the staff concludes that the method for identifying SSCs within the scope of license renewal that satisfy the EQ requirement of 10 CFR 54.4(a)(3) is adequate.

Pressurized Thermal Shock. The staff reviewed the CLB information and selected results of the applicant's review. The staff confirmed that the applicant reviewed the CLB information related to PTS, including the regulations and guidance, the USAR and correspondence with the NRC, and documented the review in a position paper. The applicant had determined that the only component within the scope of the license renewal for PTS is the reactor pressure vessel. Based on the staff's review, the staff concludes that the method for identifying SSCs within the scope of license renewal that satisfy the PTS requirement of 10 CFR 54.4(a)(3) is adequate.

Anticipated Transient Without Scram. The staff reviewed USAR Section 7.7.1.11, the ATWS position paper and selected results of the applicant's review. The staff confirmed that the applicant reviewed the applicable CLB sources including USAR Section 7.7.1.11 and developed a list of the required equipment for the event and any applicable recovery path. The applicant then identified the systems which contained the identified SCs and determined the system intended functions and included the system within the scope of license renewal. Based on the staff's review, the staff concludes that the method for identifying SSCs within the scope of license renewal that satisfy the ATWS requirement of 10 CFR 54.4(a)(3) is adequate.

Station Blackout. The staff reviewed USAR Appendix 8.3, the SBO position paper, recovery procedures, electrical diagrams and selected results of the applicant's review. The staff confirmed that the applicant reviewed USAR Appendix 8.3A which lists the equipment required to cope and recover from an SBO and documented the results in a position paper for SBO recovery. Based on the staff's review, the staff concludes that the method for identifying SSCs within the scope of license renewal that satisfy the SBO requirement of 10 CFR 54.4(a)(3) is adequate.

2.1.4.3.3 Conclusion

Based on its review, and discussions with the applicant, the staff determines that the applicant's methodology for identifying systems and structures meets the requirements of 10 CFR 54.4(a)(3) and, therefore, is acceptable.

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. In LRA Section 2.1, the applicant described the scoping methodology for systems and structures that are safety-related, nonsafety-related, and equipment relied upon to perform a function for applicable regulated events described in

10 CFR 54.4(a)(3). The scoping methodology is consistent with the guidance provided in SRP-LR and by the industry in NEI 95-10. In LRA Section 2.2, the applicant evaluated systems and structures (at plant-level scoping) to determine whether they were within the scope of license renewal, using the methodology described in LRA Section 2.1. The results of plant level scoping are provided in LRA Table 2.2-1 for mechanical systems, electrical and instrumentation and controls (I&C) systems, and structures. LRA Table 2.2-1 lists all WCGS systems and structures and whether it is in-scope, and the "Section 2 scoping results." For mechanical systems and structures within the scope of license renewal, a reference is given to the appropriate section of the application that provides a description and screening results of the system or structure. For electrical and I&C systems, no description is provided as these systems were evaluated based on the "spaces approach" and described in LRA Section 2.5. LRA Table 2.2-1 also provides the systems and structures that do not meet the criteria specified in 10 CFR 54.4(a) and; therefore, are not within the scope of license renewal.

Component Level Scoping. After the applicant identified all the systems and structures within the scope of license renewal, a review of mechanical systems and structures was performed to determine the components in each system and structure. The structural and mechanical components that supported intended functions were considered within the scope of license renewal and screened to determine if an AMR was required. The electrical and I&C components from all plant systems and structures were scoped collectively. All electrical and I&C components found within the evaluation boundary of mechanical systems were included within the scope of license renewal and evaluated using the spaces approach described in LRA Section 2.1.3.3. The applicant considered three component classifications during this stage of the scoping methodology: mechanical, structural, and electrical and I&C.

Insulation. LRA Section 2.1.4.1 states that insulation was treated as a passive and long-lived component. For systems where insulation has an intended function (i.e., to reduce heat transfer for individual room heat load calculations in support of accident analyses or safe shutdown for regulated events, or to prevent heat-up of entrapped liquid during a design basis accident so that over-pressurization will not occur), the insulation was included within the scope of license renewal and was subject to an AMR.

Consumables. LRA Section 2.1.4.1 discusses consumables. The guidance in SRP-LR Table 2.1-3 and NEI 95-10 Table 4.1-2 were used to evaluate consumables. Consumables were divided into the following four categories for the purpose of license renewal: (1) packing, gaskets, component seals, and O-rings; (2) structural sealants; (3) oil, grease, and component filters; and (4) system filters, fire extinguishers, fire hoses, and air packs.

2.1.4.4.2 Staff Evaluation

The staff reviewed the applicant's methodology for performing the scoping of plant systems and structures to ensure it was consistent with 10 CFR 54.4(a). The methodology used to determine the systems and structures within the scope of license renewal was documented in license renewal project instructions and other documents that are referenced in the audit report. The applicant's approach to systems and structures scoping provided in these documents was consistent with the methodology described in LRA Section 2.1. Specifically, the guidelines specified that the personnel performing license renewal scoping use CLB documents and describe the purpose of the system or structure (including a list of functions that the system or structure is required to accomplish). The description of purpose includes the function. Sources of information regarding the CLB for systems included the USAR, DBDs, Q-List component database, maintenance rule scoping reports, control drawings, and docketed correspondence. The applicant then compared the identified system or structure's function lists to the scoping criteria to determine whether the functions met the scoping criteria of 10 CFR 54.4(a). The applicant documented the results of the plant-level scoping in the systems and structures scoping reports on individual system and structure basis. The scoping reports contained information including a description of the system or structure, function summary, scope determination, scoping questions, identification of intended functions, CLB documents and license renewal boundary diagrams, identification of support systems, and comments.

During the scoping methodology audit, the staff performed a sampling of scoping results and concludes that the applicant's scoping reports contained an appropriate level of details to document the scoping process. Unique license renewal identification numbers were used to identify each system or structure. For example, "AB" represents main steam system and "EM" represents high pressure coolant injection system.

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

Component Level Scoping. The applicant performed a component level scoping by using the license renewal drawings in conjunction with the LRDMT or database. The LRDMT was utilized to electronically search for the components shown on the license renewal drawings. All mechanical, structural, and electrical and I&C components that perform or support an intended function, as described in 10 CFR 54.4 were included within the scope of license renewal. The components within the scope of license renewal were further evaluated during the screening process to determine whether they were subject to an AMR. The results of the applicant's scoping review were documented in license renewal scoping and screening reports. The staff reviewed these reports and finds that the methodology used by the applicant is acceptable.

Insulation. The staff reviewed the applicant's evaluation of plant insulation as documented in the applicant's position paper. The applicant identified certain insulation as being within the scope of license renewal and subject to an AMR based on it providing intended functions of mitigating the heat load into rooms or providing thermal protection for isolated piping segments inside the containment. Stainless steel reflective, asbestos, fiberglass fiber, and similar material insulation types were evaluated. During the audit, the applicant stated that it applied the same justification provided in NEI 95-10, Appendix F, Section 5.2.2.3, to exclude a section of insulation from the scope of license renewal for 10 CFR 54.4(a)(2) due to the physical impact hazard. The insulation is supported by insulation supports that are designed to withstand a seismic event for piping and equipment that are of seismic design, or fall within the Category II/I classification. However, the applicant did not indicate whether the insulation supports are within the scope of license renewal. As stated in NEI 95-10, Appendix F, piping supports for Seismic II/I piping need to be intact in order to prevent physical impacts on safety-related equipment during a seismic event and as a result must be included within the scope of license renewal.

The staff's review of LRA Section 2.1.4.1 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 2.1-3 dated April 4, 2007, the staff requested that the applicant explain how the insulation supports, that are designed to withstand a seismic event and located in areas containing safety-related equipment, were reviewed for possible inclusion within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that insulation supports designed to withstand a seismic event, and that are located in areas containing safety-related equipment within the scope of license renewal, will be added to the scope of license renewal and evaluated as non-American Society of Mechanical Engineers (ASME) component supports in accordance with NUREG-1801, Section III.B2.

By letter dated August 31, 2007, the applicant amended the LRA to include these supports within the scope of license renewal.

Based on its review, the staff finds the applicant's response acceptable because the applicant adequately included the insulation supports in question within the scope of license renewal. The staff's concern described in RAI 2.1-3 is resolved.

Consumables. The staff reviewed the applicant's evaluation of the consumables as documented in the LRA and the applicant's implementing procedures. Group (a) subcomponents are not credited with maintaining the integrity of the pressure boundary function of valve, pump and similar component housings and; therefore, are not subject to an AMR. Group (b) subcomponents are structural sealants associated with structures within the scope of license renewal that require an AMR. The structural AMR will evaluate the use of these components. Group (c) subcomponents are short-lived consumables that are periodically replaced and; therefore, not subject to an AMR. Group (d) system filters are periodically replaced based on manufacturers' requirements. Fire extinguishers, fire hoses and air packs are periodically inspected and tested in accordance with the requirements of site-specific instructions that implement applicable National Fire Protection Association guidelines as documented in the Fire Hazards Analysis and; therefore, not subject to an AMR.

Based on its review, the staff finds that the applicant followed the process consistent with SRP-LR, and appropriately identified and categorized the various consumables in accordance with the guidance. Plant consumables were initially identified and evaluated to determine if any met the criteria requiring an AMR. Additionally, the applicant identified all pertinent industry guidelines which were used as the basis for replacement of the item.

2.1.4.4.3 Conclusion

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

2.1.4.5 Mechanical System Component Scoping

2.1.4.5.1 Summary of Technical Information in the Application

LRA Section 2.1.3.1 describes the methodology for identifying mechanical system components that are within the scope of license renewal. A component was determined to be within the scope of license renewal, if it meets any of the scoping criteria of 10 CFR 54.4(a)(1), (a)(2), or (a)(3). In performing the mechanical component scoping, the applicant used the license renewal database in conjunction with the license renewal drawings. A list of components was developed from the plant component database downloading into the license renewal database component table. The drawings for each mechanical system within the scope of license renewal were reviewed to identify those components, within the system, that are needed to perform or support a system intended function. Also, each of these components was evaluated individually to determine whether the component supports a system level intended function and meets any of the three 10 CFR 54.4(a) criteria. Components meeting any of the three criteria were identified in the license renewal database as within the scope of license renewal. Components not meeting any of these three criteria were identified in the license renewal database as outside the scope of license renewal. Also, not all the components on the drawings are included in the plant component and license renewal database. The results of the component scoping are documented in the license renewal database. LRA Section 2.3 describes the scoping results of each mechanical system and associated component that is within the scope of license renewal.

2.1.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.1, the guidance in the license renewal project instruction, and the scoping reports to complete the review of the mechanical scoping process. The license renewal project instruction provides guidance for identifying and evaluating individual mechanical system components as required by 10 CFR 54.4. The CLB documents were utilized when determining whether a system or component is within the scope of license renewal. Examples of these sources included, but were not limited to, the USAR, maintenance rule database, position papers for ATWS, EQ, fire protection and SBO documents, technical specifications, and safety evaluation reports. Additional sources of mechanical component information included the WCGS component database and individual license renewal drawings.

Mechanical system drawings were evaluated to create license renewal boundaries for each system showing the components within the scope of license renewal. Each license renewal drawing was evaluated to identify the components that perform a safety-related intended function or support a regulated event. These drawings were further evaluated during the screening process to determine if the component should be subject to an AMR. Nonsafety-related components that are connected to safety-related components and provide structural support at the safety-related and nonsafety-related interface, or components whose failure could prevent satisfactory accomplishment of a safety-related function due to spatial interaction are included within the scope of license renewal. As part of the applicant's verification process, the list of mechanical components identified as within the scope of license renewal were compared to data in the license renewal database to confirm the scope of components in the system.

The staff reviewed the implementation guidance provided in license renewal project instruction, the scoping reports, 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 project instruction for scoping and screening describes the applicant's process for identifying systems and structures that are within the scope of license renewal. If a component was determined to perform an intended function that met any of the criteria in 10 CFR 54.4(a), then the component was determined to be within the scope of license renewal. The results of the scoping review were documented in the license renewal database, and the scoping results were documented in individual scoping reports.

The staff conducted detailed discussions with the applicant's license renewal project 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 also reviewed scoping evaluation results for auxiliary feedwater and high pressure coolant injection systems to verify proper implementation of the scoping process. Based on these audit activities, the staff did not identify any discrepancies between the methodology documented and the implementation results. Further, the staff determines that the applicant's proceduralized methodology is consistent with the description provided in LRA Section 2.1 and the guidance contained in SRP-LR Section 2.1, and was adequately implemented. The staff's scoping review (based on a sample of the applicant's scoping results) of the auxiliary feedwater system is provided below:

Scoping Methodology for the Auxiliary Feedwater System. In LRA Section 2.3.4.6, the applicant provided the scoping and screening methodology results for SSCs within the auxiliary feedwater system. The auxiliary feedwater system is a safety-related system and is relied upon as the source of feedwater supply to the steam generators to maintain a secondary heat sink for DBE mitigation. The auxiliary feedwater system is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1). Also, portions of the auxiliary feedwater system support fire protection, SBO, and ATWS requirements. During the audit, the staff's review of the applicant's scoping results for the auxiliary feedwater system identified the safety-related functions discussed below.

The auxiliary feedwater system has the following intended functions meeting the scoping requirements of 10 CFR 54.4(a)(1):

- Perform automatic transfer to essential service water (ESW) for auxiliary feedwater system supply on low suction pressure from the condensate storage tank (CST) to maintain a heat sink for decay heat removal
- Limit feedwater flow to a faulted steam generator during accident conditions
- Supply dedicated safety grade feedwater to steam generators during accidents, transients, plant trips and loss of offsite power to ensure adequate heat sink for the reactor coolant system

The auxiliary feedwater system has no intended functions meeting the scoping requirements of 10 CFR 54.4(a)(2).

The auxiliary feedwater system has the following intended functions meeting the scoping requirements of 10 CFR 54.4(a)(3):

- The system is relied on to demonstrate compliance with the fire protection requirements described in 10 CFR 50.48.
- The system is relied on to demonstrate compliance with the ATWS requirements described in 10 CFR 50.62.
- The system is relied on to demonstrate compliance with the SBO requirements described in10 CFR 50.63. Provides feedwater to steam generators using the CST as the water source for decay heat removal.

Also, during the audit, the staff reviewed the applicant's methodology for identifying auxiliary feedwater mechanical component types meeting the scoping criteria as defined in the Rule. The staff reviewed the scoping methodology implementation procedures and discussed the methodology and the results with the applicant. The staff verified that the applicant identified and used pertinent engineering and licensing information in order to determine the auxiliary feedwater 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 auxiliary feedwater system, the basis for inclusion of the intended function, and the process used to identify each of the system components credited with performing the intended function. The staff verified that the applicant had identified and highlighted system drawings to develop the system boundaries in accordance with the procedural guidance. The applicant was knowledgeable about the process and conventions for establishing boundaries as defined in the license renewal implementation procedures. Additionally, the staff verified that the applicant had independently verified the scoping results in accordance with the governing procedures.

2.1.4.5.3 Conclusion

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

2.1.4.6 Structural Component Scoping

2.1.4.6.1 Summary of Technical Information in the Application

LRA Section 2.1.3.2 describes the methodology for identifying structures that are within the scope of license renewal. A list of all structures at WCGS was developed through review of site drawings in conjunction with a walkdown of the property. These structures are listed in LRA Table 2.2-1. The USAR was relied upon to identify the safety classifications of structures and structural components. The structure descriptions were prepared and the structure boundaries were determined. This information was included in the license renewal database. All structure functions were evaluated against the requirements of 10 CFR 54.4(a)(1), (a)(2) and (a)(3) and the results of this evaluation were documented in the license renewal database. LRA Section 2.4 describes the scoping results for the individual structures that are within the scope of license renewal. For example, LRA Section 2.4.5 describes the purpose, intended functions and seismic classification for the auxiliary building. The auxiliary building is a safety-related, seismic Category I structure that provides support, shelter, and protection to engineered safety features and nuclear auxiliary systems equipment.

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 project instruction for scoping and screening describes the applicant's process for identifying systems and structures that are within the scope of license renewal. If a structure was determined to perform an intended function that met any of the criteria in 10 CFR 54.4(a), then the structure was determined to be within the scope of license renewal. The results of the scoping review were documented in the LRDMT or database, and the scoping results were documented in individual scoping reports.

The staff reviewed the applicant's project instruction and scoping reports. Structural scoping was performed in a manner to ensure that all plant buildings and yard structures were considered. The scoping reports identified the intended functions for each structure required for compliance with 10 CFR 54.4(a). The structural intended functions were identified based on the guidance provided in NEI 95-10, Appendix B. For structures, the evaluation boundaries were determined by developing a complete description of each structure and its intended functions. The results of the review were documented in the scoping reports which contain a description of the structure, evaluation results for each of the 10 CFR 54.4(a) criteria, a description of structural intended functions and source reference information for the functions. Sources of information for structure identification and intended functions include the USAR, drawings, position papers developed for the regulated events, and other CLB sources such as the fire hazards analysis and flood analysis.

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

2.1.4.6.3 Conclusion

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

2.1.4.7 Electrical Component Scoping

2.1.4.7.1 Summary of Technical Information in the Application

The LRA states that the USAR descriptions, maintenance rule database records, CLB documents and DBDs were reviewed to determine the system safety classification and to identify all of the system functions. All system level functions were evaluated against the requirements of 10 CFR 54.4(a)(1), (a)(2) and (a)(3). The supporting systems needed to maintain the system intended functions were identified and evaluated against the requirements of 10 CFR 54.4(a)(2). The results of the system level scoping along with a list of references supporting the evaluation of each electrical and instrument and control system were documented in the license renewal database.

The LRA states that all electrical and I&C components that perform an intended function as described in 10 CFR 54.4 were included within the scope of license renewal. The installed electrical components were identified by reviewing documents such as plant drawings and databases. Additionally industry documents, such as NEI 95-10, provided a list of typical electrical components found in nuclear power plants. These lists were reviewed against engineering information for the plant to determine which electrical component types were installed at WCGS.

2.1.4.7.2 Staff Evaluation

The staff evaluated LRA Section 2.1.3.3 and the program guidelines to complete the review of the electrical scoping process. The program guidelines provide instructions for identifying and evaluating individual electrical systems with respect to the scoping criteria including specific information on the electrical systems credited for the regulated events of 10 CFR 54.4(a)(3). Various CLB documents were utilized when determining whether a system is within the scope of 10 CFR 54.4(a) which included the USAR descriptions, maintenance rule database records, CLB documents and DBDs. The applicant identified all electrical systems which met the requirements of 10 CFR 54.4(a)(1), (a)(2), and (a)(3), identified the specific intended functions, and documented the results in a system scoping package and the license renewal database. If an electrical system was considered to be within the scope of license renewal, all its components were also included within the scope of license renewal.

The staff reviewed the implementation guidance and the CLB documents associated with electrical scoping, and finds that the guidance and CLB source information noted above were acceptable to identify if the electrical components were 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 determines that the applicant's proceduralized methodology is consistent with the description provided in LRA Section 2.1.3.3 and the guidance contained in SRP-LR Section 2.1 and was adequately implemented.

2.1.4.7.3 Conclusion

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

2.1.4.8 Conclusion for Scoping Methodology

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

2.1.5 Screening Methodology

2.1.5.1 General Screening Methodology

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

2.1.5.1.1 Summary of Technical Information in the Application

In LRA Section 2.1.4, the applicant discussed the method of identifying components from systems and structures that are within the scope of license renewal and that are subject to an AMR. The applicant's screening process consisted of identifying and listing the SCs that are subject to an AMR. All of the SCs categorized as within the scope of the license renewal were screened against the criteria of 10 CFR 54.21(a)(1)(i) and (a)(1)(ii) to determine whether they are subject to an AMR. Section 54.21 of 10 CFR states that the SCs subject to an AMR shall encompass those SCs within the scope of license renewal rule if they perform an intended function, as described in 10 CFR 54.4, without moving parts or without a change in configuration or properties; and are not subject to replacement based on a qualified life or specified time period. Active components were screened out and; therefore, did not require an AMR. The screening process also identified short-lived components and consumables. The short-lived components are not subject to an AMR. Also, in its screening process, the applicant incorporated the industry guidance provided in NEI 95-10, Appendix B. The screening of system SCs at WCGS was performed using the LRDMT.

2.1.5.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21, each LRA must contain an IPA that identifies SCs within the scope of license renewal that are subject to an AMR. The IPA must identify components that perform an intended function without moving parts or a change in configuration or properties (i.e., passive), as well as components that are not subject to periodic replacement based on a qualified life or specified time period (i.e., 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, electrical and structural component types 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 2.1.4, the applicant discussed these screening activities as they relate to the component types and commodity groups within the scope of license renewal. The screening process evaluated these component types to determine which ones were long-lived and passive and; therefore, subject to an AMR. For verification purpose, the staff reviewed LRA Sections 2.3, 2.4, and 2.5 that provide the results of the process used to identify component types and subject to an AMR.

During the audit, the applicant provided the staff with detailed discussion and demonstrations of the screening processes used for each discipline and provided documentation that described the screening methodology and screening results. Also as part of the audit, the staff reviewed the screening results reports for the auxiliary feedwater and high pressure coolant injection systems and the auxiliary building structure. Specific methodology for mechanical, electrical, and structural is discussed the following sections.

2.1.5.1.3 Conclusion

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

2.1.5.2 Mechanical Component Screening

2.1.5.2.1 Summary of Technical Information in the Application

LRA Section 2.1.4.1 describes the screening methodology for identifying passive and long-lived mechanical components that are subject to an AMR. After the mechanical systems and the component scoping was performed, the applicant initiated the screening process for the mechanical components. After a mechanical system component was categorized in the license renewal database as within the scope of license renewal, the classification as an active or passive component was determined based on evaluation of the component description and type. In this determination, the applicant used the guidance provided in NEI 95-10, Appendix B. Components within the scope of license renewal that are determined to be passive and long-lived were identified in the license renewal database as subject to an AMR. Each component that was identified as subject to an AMR was evaluated to determine its intended function, which was based on an evaluation of its type and support of the system intended function. The results of the component screening are recorded in the screening reports of the license renewal database. Components that were determined to be short-lived were eliminated from the AMR process and the basis for the classification as short-lived was recorded in the license renewal database.

The screening of mechanical components includes utilization of the license renewal drawings and the license renewal database. Components subject to an AMR (i.e., passive, long-lived components that support system intended functions) are highlighted on the drawings to indicate that the component is subject to an AMR. LRA Section 2.3 summarizes the screening results of the mechanical components.

2.1.5.2.2 Staff Evaluation

The staff evaluated the mechanical screening methodology in LRA 2.1.4.1, the license renewal project instruction for screening methodology, the license renewal drawings, and the screening and AMR reports, as referenced in the audit report. The mechanical system screening process began with the results from the scoping process. The applicant reviewed mechanical system drawings to identify passive and long-lived components. To identify system components required to perform a system's intended function, the applicant initially generated a listing of mechanical system components based on information derived from the drawings and the license renewal database. The system boundaries are determined based on the drawings, which depict the system principal functional components. Components that are within the scope of license renewal are evaluated for active and passive functions following the guidance of NEI 95-10, Appendix B. The components that are within the scope of license renewal pursuant to 10 CFR 54.4(a)(1) and (a)(3) are highlighted in green on the license renewal drawings, whereas, those components that are within the scope of license renewal pursuant to 10 CFR 54.4(a)(2) are highlighted in red.

The applicant's project instruction provides detailed implementation guidance on the applicant's process for identifying and screening mechanical components that are subject to an AMR. The project instruction delineates that all mechanical components that perform or support an intended function and are passive and long-lived are subject to an AMR. In addition, the screening results for each system within the scope of license renewal are presented in separate screening reports.

The staff reviewed the applicant's methodology used for mechanical component screening as described in the LRA, and reviewed the applicant's implementing guidance and screening reports. The applicant performed the screening review in accordance with the implementation guidance and captured pertinent component information such as materials, environments, and references. The staff verified that the applicant implemented the guidance in SRP-LR and NEI 95-10 and had followed that guidance in performing the screening effort. The staff confirmed that the applicant developed sufficiently detailed procedures for the screening of mechanical systems, implemented those procedures, and adequately documented the results in the associated AMR reports.

Additionally, the staff reviewed the screening activities associated with the auxiliary feedwater and the high pressure coolant injection systems. The staff reviewed the system intended functions and associated source documents identified for these systems, the drawings, and the associated screening documented in the screening results and AMR reports. The staff did not identify any discrepancies with the evaluation, and determines that the applicant adequately followed the process documented in the license renewal project instruction, and adequately documented the results in the screening and AMR reports for the above systems.

2.1.5.2.3 Conclusion

Based on its review of the LRA, the screening implementation procedures, and a sample of auxiliary feedwater and the high pressure coolant injections systems screening results, the staff determines that the applicant's mechanical component screening methodology is consistent with the guidance described in the SRP-LR. The staff concludes that the applicant's methodology for identification of passive, long-lived mechanical components within the scope of license renewal and subject to an AMR meets the requirements of10 CFR 54.21(a)(1).

2.1.5.3 Structural Component Screening

2.1.5.3.1 Summary of Technical Information in the Application

LRA Section 2.1.4.2 describes the screening methodology for identifying passive and long-lived structural components that typically perform their functions without moving parts and without a change in configuration or properties. When a structure or structural component was determined to be within the scope of license renewal, the structure screening methodology classified the component as passive. During the structural screening process, the intended function(s) of structural components were determined and recorded in the license renewal database. Additionally, an evaluation was performed to determine whether structural components within the scope of license renewal are subject to replacement based on a qualified time period. If a structural component was determined to be subject to replacement based on a qualified time period, the component was identified as short-lived and was excluded from an AMR. The basis for determining that the structural component was short-lived was documented in the license renewal database. LRA Section 2.4 provides the screening results for structures.

2.1.5.3.2 Staff Evaluation

The staff reviewed the applicant's methodology for identifying structural components that are subject to an AMR pursuant to10 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 the auxiliary building that was identified as within the scope of license renewal.

The applicant's project instruction provides detailed implementation guidance on the applicant's process for identifying and screening structural components that are subject to an AMR. The project instruction delineates that all structural components that perform an intended function and are passive and long-lived are subject to an AMR. In addition, the screening results for each structure within the scope of license renewal are presented in separate screening reports.

The staff reviewed the applicant's methodology used for structural component screening described in the LRA, and in the applicant's implementing guidance and screening reports. The applicant performed the screening review in accordance with the implementation guidance and captured pertinent component information such as materials, environments, and references.

The staff verified that the applicant used the lists of passive SCs embodied in the regulatory guidance as a starting point and supplemented the lists with additional items either unique to the site or as generic components (e.g., concrete, non-containment isolation penetrations) for which a direct match to the generic lists did not exist.

The staff also evaluated the applicant's results from the implementation of this methodology by reviewing the auxiliary building which was identified as being within the scope of license renewal. In addition, the staff reviewed the screening report associated with the screening methodology to verify if the applicant performed a comprehensive evaluation and identified the relevant structural components as part of their evaluation. The review included the evaluation of components within the scope of license renewal, the corresponding component-level intended functions, and the resulting list of components subject to an AMR. The staff also discussed the process and results with the applicant. The staff did not identify any discrepancies between the methodology documented and the implementation results.

2.1.5.3.3 Conclusion

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

2.1.5.4 Electrical Component Screening

2.1.5.4.1 Summary of Technical Information in the Application

The LRA states that the screening of electrical and I&C components had been accomplished by identifying electrical components within the scope of license renewal as passive and long-lived based on the determinations documented in NEI 95-10, Appendix B. The passive, long-lived electrical and I&C components that perform an intended function without moving parts or without change in configuration or properties were grouped into component types such as cable, connections, fuse holders, terminal blocks, high-voltage transmission conductor, connections and insulators, switchyard bus and connections. Component-level intended function(s) were determined for each passive electrical component group within the scope of license renewal and recorded in the license renewal database. The passive, long-lived electrical component types within the scope of license renewal were identified in the license renewal database as subject to an AMR.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant's methodology used for electrical screening in LRA Section 2.1.4.3 and the applicant's guidance, implementation procedures and reports. The staff confirmed that the applicant had assembled a table of commodities which were determined to meet the passive criteria which were grouped in accordance with the guidance contained in NEI 95-10 which included cable, connections, fuse holders, terminal blocks, high-voltage transmission conductor, connections and insulators, switchyard bus and connections. The applicant evaluated the identified passive commodities to determine whether they were subject to replacement based on a qualified life or specified time period (i.e., short-lived), or not subject to replacement based on a qualified life or specified time period (i.e., 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 applicant's implementing procedures and reports.

2.1.5.4.3 Conclusion

The staff reviewed the LRA, procedures, electrical drawings, and a sample of the results of the screening methodology. The staff determines that the applicant's methodology is 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 subject to an AMR is consistent with the requirements of 10 CFR 54.21(a)(1) and, therefore, is acceptable.

2.1.5.5 Conclusion for Screening Methodology

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

2.1.6 Summary of Evaluation Findings

The information in LRA Section 2.1, the supporting information in the scoping and screening implementation procedures and reports, and the information presented during the scoping and screening methodology audit formed the basis of the staff's determination that the applicant's scoping and screening methodology is consistent with the requirements of the Rule. Based on its 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 54.21(a)(1) and, therefore, is acceptable.

2.2 Plant-Level Scoping Results

2.2.1 Introduction

In LRA Section 2.1, the applicant described the methodology for identifying SSCs within the scope of license renewal. In LRA Section 2.2, the applicant used the scoping methodology to determine which SSCs must be included within the scope of license renewal. The staff reviewed the plant-level scoping results to determine whether the applicant has properly identified all systems and structures relied upon to remain functional during and following DBEs, as required by 10 CFR 54.4(a)(1), systems and structures the failure of which could prevent satisfactory accomplishment of any safety-related functions, as required by 10 CFR 54.4(a)(2), and systems and structures relied on in safety analyses or plant evaluations to perform functions required by regulations referenced in 10 CFR 54.4(a)(3).

2.2.2 Summary of Technical Information in the Application

In LRA Tables 2.2.1, 2.2.2, and 2.2.3, the applicant listed plant mechanical systems, structures, and electrical and I&C systems within the scope of license renewal. From DBEs factored into the plant CLB, other CLB information on 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 54.4.

2.2.3 Staff Evaluation

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

The staff determined whether the applicant properly identified the systems and structures within the scope of license renewal in accordance with 10 CFR 54.4. The staff reviewed selected systems and structures that the applicant did not identify as 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 sampled the contents of the USAR based on the systems and structures listed in LRA Table 2.2-1 to determine if there were any systems or structures that may have intended functions within the scope of license renewal, as defined by 10 CFR 54.4, but were omitted from the scope of license renewal. The staff did not identify any omissions.

2.2.4 Conclusion

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

2.3 Scoping and Screening Results: Mechanical Systems

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

- reactor vessel and internals (RVI), and reactor coolant system (RCS)
- engineered safety features (ESFs)
- 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 were subject to an AMR in accordance with 10 CFR 54.21(a)(1).

In its scoping evaluation, the staff reviewed the applicable LRA sections and 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 USAR, for each mechanical system to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated pursuant to 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions delineated pursuant to 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.

2.3.1 Reactor Vessel Internals, and Reactor Coolant System

LRA Section 2.3.1 identifies the RVI and RCS SCs subject to an AMR for license renewal.

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

- 2.3.1.1 reactor vessel and internals
- 2.3.1.2 reactor coolant system
- 2.3.1.3 steam generators
- 2.3.1.4 reactor core

The staff's findings on review of LRA Sections 2.3.1.1 - 2.3.1.4 are in SER Sections 2.3.1.1 - 2.3.1.4, respectively.

2.3.1.1 Reactor Vessel and Internals

2.3.1.1.1 Summary of Technical Information in the Application

LRA Section 2.3.1.1 describes the RVI which support the reactor core and control rod drive mechanisms and provide a pressure boundary for reactor coolant. The RVI support the core, maintain fuel alignment, direct coolant flow, and provide gamma and neutron shielding. The nozzle-supported, cylindrical reactor vessel has a welded, hemispherical bottom head and a removable, flanged, hemispherical upper head. The vessel contains the core, core-supporting structures, control rods, and other parts directly associated with the core. The top head also has penetrations for the control rod drive mechanisms and the head vent pipe. O-ring leak-monitoring tube penetrations are located in the vessel flange. The vessel has inlet and outlet nozzles located in a horizontal plane just below the reactor vessel flange but above the top of the core. The bottom head of the vessel has penetration nozzles for connection and entry of the nuclear in-core instrumentation.

The RVI have safety-related components relied upon to remain functional during and following DBEs. In addition, the RVI perform functions that support fire protection, PTS, and SBO as documented in the LRA.

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

- RV closure head
- RV control rod drive head penetration
- RV core support pads
- RV nozzle safe ends and welds
- RV nozzles
- RV penetrations
- RV shell
- RV shell head
- RVI baffle/former assembly
- RVI control rod guide tube assembly
- RVI core barrel assembly
- RVI instrumentation support structures
- RVI lower internals assembly
- RVI upper internals assembly

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

- spray shield, curbs, or mechanical components for directing flow
- pressure boundary
- structural and/or functional support to safety-related components
- shielding against radiation

2.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.1 and USAR Sections 3.9(N).5, 5.1, 5.2, and 5.3 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.1.1 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 2.3.1.1-1 dated May 6, 2007, the staff noted that USAR Figures 18.2-1 and 18.2-13 show the reactor head vent system and the reactor vessel level instrumentation system, respectively. The staff requested that the applicant indicate which portions of the reactor head vent system are within the scope of license renewal. In addition, the staff requested that the applicant clarify if the spare head penetration of the level instrumentation system is within the scope of license renewal.

In its response dated June 1, 2007, the applicant stated that the portions of the reactor head vent system that are within the scope of license renewal are shown in drawing LR-WCGS-BB-M-12BB04. The applicant clarified that the boundary starts from the connection with the vessel head, located at coordinate E-4, up to the second isolation valves, located at coordinates F-2 and G-2. The applicant stated that these components have an intended function of pressure boundary and are within the scope of license renewal pursuant to 10 CFR 54.4(a)(1).

The applicant further stated that the reactor vessel level instrumentation system used a spare vessel head penetration for the upper level tap. The vessel head still has several blind flanged spare penetrations, all of which have the intended function of pressure boundary and are within the scope of license renewal pursuant to 10 CFR 54.4(a)(1). The applicant clarified that the portions of the reactor vessel instrumentation system that are within the scope of license renewal are also shown on drawing LR-WCGS-BB-M-12BB04, from coordinates E-4 to F-5. The applicant clarified that the head penetration of the level instrumentation system and the spares are addressed in LRA Table 2.3.1-1 as a component type of reactor vessel penetrations.

Based on its review, the staff finds the applicant's response to RAI 2.3.1.1-1 acceptable because it clarified that the components in question are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.1.1-1 is resolved.

Based on its review, the staff finds that the reactor vessel is within the scope of license renewal. It is the key Class 1 component in the pressure-retaining boundary because it enables proper cooling of the core under normal and accident conditions. Many of the reactor vessel and internals and reactor vessel level instrumentation system are also within the scope of license renewal because they perform functions as delineated in 10 CFR 54.4(a)(1). Reactor vessel internals such as seals and gaskets are typically not within the scope of license renewal since those components are periodically replaced.

The staff finds long-lived, passive, and pressure-retaining components, that are within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a), are incore instrumentation components. Among these are the incore neutron flux detector thimbles, the pressure-retaining incore thermocouples, and various pressure-retaining tubes and tube fittings. Unlike the surrounding fuel element assemblies, these incore instrumentation system components are not replaced periodically. They provide guidance and pathways through which instrument sensors are routed, and these pathways constitute part of the pressure-retaining boundary. Basically, the incore instrumentation system components are pressure-retaining tubes made of a stainless steel and nickel based alloy that must withstand a borated water environment.

The staff also finds that many of the reactor vessel internals are identified as components that provide structural support to safety-related components. For example, they can provide the structural support needed to maintain a coolable core geometry during a design basis loss of coolant accident (LOCA). Unlike many other long-lived, passive components, certain reactor internals are normally moved (i.e., removed and set aside) to allow the movement of fuel assemblies during refueling. This provides occasional opportunities to detect and remedy aging-related problems that might affect these reactor vessel internals. Although these components have the benefit of periodic examination, they should be and are included within the scope of license renewal and subject to an AMR.

No omissions of SSCs, that are within the scope of license renewal and subject to an AMR, were found.

2.3.1.1.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor vessel internals 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).

2.3.1.2 Reactor Coolant System

2.3.1.2.1 Summary of Technical Information in the Application

LRA Section 2.3.1.2 describes the RCS, which is designed to maintain the reactor coolant at adequate conditions of temperature, pressure, and flow to protect the core from damage (in conjunction with the reactor control and protection systems). The RCS is designed to maintain boron homogeneity and reactor coolant temperature such that uncontrolled reactivity changes do not occur. The RCS pressure boundary is designed to provide a barrier to limit leakage of reactor coolant and release of radioactive isotopes. The RCS provides containment isolation for penetrations P-22, P-39, P-40, P-41, P-59, P-62 and P-91. The RCS transfers the heat generated in the reactor core and by the reactor coolant pumps (RCPs) to the steam generators for further transfer to the main steam system to produce steam to drive the turbine-generator. The borated demineralized water circulated in the RCS acts as a neutron moderator and reflector, as a neutron absorber for chemical shim control in the reactor core, and as a heat transfer medium.

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

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

- Class 1 piping (less than or equal to 4-inch)
- closure bolting
- flow element
- heat exchanger shell side
- heat exchanger tube side
- instrument bellows
- piping
- pressurizer relief tank
- pump
- pressurizer heater bundle diaphragm plate
- pressurizer heater sheaths and sleeves
- pressurizer instrument penetrations
- pressurizer integral support
- pressurizer manways and covers
- pressurizer nozzles
- pressurizer shells/heads
- pressurizer safe ends
- rupture disc
- thermowell
- tubing
- valve

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

- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- structural and/or functional support to safety-related components
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.2 and USAR Sections 5.1, 5.2, 5.4, and 9.5B 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 confirmed agreement with the applicant's results with the following observations.

Based on its review, the staff finds that the applicant included the pressurizer relief tank in the pressure-retaining boundary. The pressure-retaining boundary of the pressurizer relief tank will be maintained until the tank's rupture disks give way, as designed, at about 100 psid. Upstream of the pressurizer relief tank, the pressurizer relief and safety valves protect the pressure-retaining boundary, as they open and reseat, to limit RCS pressure by discharging steam to the pressurizer relief tank (e.g., during a transient). Since, during normal operation, the pressurizer relief tank also collects the steam that may leak through the pressurizer relief and safety valves, it is included within the scope of license renewal. Therefore, the staff finds this acceptable.

The staff noted that the pressurizer nozzles are included within the scope of license renewal; however, the pressurizer spray head is not. The spray head distributes normal and auxiliary pressurizer spray water into the pressurizer steam bubble, which tends to depressurize the pressurizer and the RCS (subsequently). Since the normal and auxiliary pressurizer sprays are not safety systems, they cannot be relied upon to function during any of the accident analyses, unless, in some postulated analysis cases, pressurizer spray could have an aggravating effect upon the transient results. Therefore, the spray function is not credited for the mitigation of any accidents addressed in the USAR accident analyses. However, in a manual mode, the spray function can be used to reduce RCS pressure following a steam generator tube rupture event, in order to end the primary-to-secondary side tube break flow. The staff referred this issue to the Region IV staff for their evaluation during its scoping and screening inspection.

The Region IV staff performed its scoping and screening inspection during the weeks of September 10 and October 22, 2007. As documented in its inspection report dated December 5, 2007, the staff noted that the pressurizer spray head is used by operators to reduce and control reactor pressure during some accident scenarios. The inspectors reviewed the applicant's justification for not including the pressurizer spray head within the scope of license renewal. The staff interviewed plant personnel and reviewed basis documents provided by the applicant that support its position that the pressurizer spray head does not perform any pressure boundary function, is not a component critical to perform a safe shut down of the plant during an accident, and is isolated in response to a control room fire. The staff finds that, since the pressurizer spray head has no safety function, the applicant's position of not including this component within the scope of license renewal is consistent with the guidance provided in the GALL Report and 10 CFR 54.4(a).

2.3.1.2.3 Conclusion

The staff reviewed the LRA, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RCS 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).

2.3.1.3 Steam Generators

2.3.1.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1.3 describes the steam generators, which remove heat by generating steam for normal operation, DBE mitigation, SBO, and fire safe shutdown requirements. The steam generators are also an assured source of steam for the turbine-driven auxiliary feedwater pump. The primary channel head and tubes form part of the reactor coolant pressure boundary. The steam generators form part of the containment pressure boundary to prevent the release of fission products to the environment. The steam generators system consists of primary and secondary pressure boundaries including all pieces and parts within the pressure boundary and all penetrations out to and including the safe ends of the penetration nozzles.

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

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

- steam generator closure bolting
- steam generator feedring
- steam generator flow distribution baffle
- steam generator internal structures
- steam generator plugs
- steam generator primary head and divider plate
- steam generator primary manways and flanges
- steam generator primary nozzles and safe ends
- steam generator secondary manways and flanges
- steam generator secondary nozzles and safe ends
- steam generator secondary shell
- steam generator tube support plates
- steam generator tubes
- tubing

The intended functions of the steam generators component types within the scope of license renewal include:

- flow restriction
- spray shield, curbs, or mechanical components for directing flow
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.3 and USAR Sections 5.4.2 and 10.3.1.1 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the steam generators 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).

2.3.1.4 Reactor Core

2.3.1.4.1 Summary of Technical Information in the Application

LRA Section 2.3.1.4 describes the reactor core, which allows efficient heat transfer to the coolant and provides a fission product barrier through its fuel assemblies. The reactor core includes an array of fuel assemblies similar in mechanical design but different in fuel enrichment. Fuel assemblies contain the fissionable material that sustains a nuclear reaction when the reactor core is critical. Each fuel assembly consists of 264 fuel rods, 24 guide thimble tubes, and one instrumentation thimble tube arranged within a supporting structure. The fuel assembly structure consists of a bottom nozzle, thimble screws, top nozzle, guide thimbles, inserts, lock tubes, and grids.

The reactor core is within the scope of license renewal based on the criteria of 10 CFR 54.4(a)(1).

The applicant concludes that relative to license renewal review, the reactor core does not have components with intended functions within the scope of license renewal (short-lived).

LRA Table 2.3.1-4 shows no reactor core component types within the scope of license renewal and subject to an AMR.

2.3.1.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.1.4 and USAR Section 4.2 using the evaluation methodology described in SER Section 2.3 and the guidance described in SRP-LR Section 2.3.

During its review, the staff evaluated the system functions described in the LRA and USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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).

Based on its review, the staff finds that the applicant adequately included the reactor core within the scope of license renewal as required by 10 CFR 54.4(a)(1). The core figures prominently in plant safety considerations, during normal operation and also during accidents and transients, since it contains the source of fission products and the first fission product barrier. However, the core components (e.g., fuel assemblies, rod cluster control assemblies and burnable absorber assemblies) are not subject to an AMR, since they are short-lived, and periodically replaced during the plant lifetime.

2.3.1.4.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor core 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).

2.3.2 Engineered Safety Features

LRA Section 2.3.2 identifies the ESFs subject to an AMR for license renewal. The applicant described the supporting SCs of the ESFs in the following LRA sections:

- 2.3.2.1 nuclear sampling system
- 2.3.2.2 containment spray system
- 2.3.2.3 containment integrated leak rate test system

- 2.3.2.4 decontamination system
- 2.3.2.5 liquid radwaste system
- 2.3.2.6 reactor makeup water system
- 2.3.2.7 containment purge heating, ventilating, and air conditioning (HVAC) system
- 2.3.2.8 breathing air system
- 2.3.2.9 hydrogen control system
- 2.3.2.10 high pressure coolant injection system
- 2.3.2.11 residual heat removal (RHR) system

The staff's findings on review of LRA Sections 2.3.2.1-2.3.2.11 are in SER Sections 2.3.2.1-2.3.2.11, respectively.

2.3.2.1 Nuclear Sampling System

2.3.2.1.1 Summary of Technical Information in the Application

LRA Section 2.3.2.1 describes the nuclear sampling system, which provides automatic isolation functions for the system containment penetrations. The nuclear sampling system obtains and analyzes samples from various systems and locations in the nuclear steam supply system for radiological monitoring and control of chemistry parameters. The system consists of piping, tubing, valves, coolers and analysis equipment necessary to collect and analyze process stream samples. Sample station rooms are located in the auxiliary building, radwaste building, and turbine building to service nuclear steam supply system, radwaste, and secondary sample points, respectively.

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

LRA Table 2.3.2-1 identifies nuclear sampling system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow indicator
- piping
- tubing
- valve

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

- pressure boundary

- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.1 and USAR Sections 5.1, 5.4, and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the nuclear sampling 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).

2.3.2.2 Containment Spray System

2.3.2.2.1 Summary of Technical Information in the Application

LRA Section 2.3.2.2 describes the containment spray system, which removes decay heat and radioactive iodine from the containment atmosphere in post-accident conditions to maintain containment pressure below design limits and offsite release less than 10 CFR Part 100 limits. Containment isolation valves, suction line guard pipes, and valve encapsulations maintain containment integrity in single-failure scenarios. Borated alkaline water from the containment spray system removes decay heat and iodine from the containment atmosphere in post-accident conditions. The system consists of two redundant trains, each with a containment spray pump, spray nozzles, valves, and piping. There are suction paths coming from the refueling water storage tank (RWST) for initial system flow and from the containment recirculation sumps for long-term operation. Each train has a discharge path through the spray nozzles in the upper containment. A common spray additive tank provides sodium hydroxide via eductors to both trains to ensure a basic pH that promotes absorption of iodine from the containment atmosphere.

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

LRA Table 2.3.2-2 identifies containment spray system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- eductor
- expansion joint
- flow element
- orifice
- piping
- pump
- spray nozzle
- tank
- tubing
- valve
- vortex breaker

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

- spray shield, curbs, or mechanical components for directing flow
- pressure boundary
- maintains mechanical and structural integrity maintenance to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components
- conversion of fluid into spray

2.3.2.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.2 and USAR Section 6.5.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.2 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 2.3.2.2-1 dated April 18, 2007, the staff requested that the applicant clarify if the pump casings and valve bodies in the containment spray system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in LRA drawing LR-WCGS-EN-12EN01 are included in the component types listed in LRA Table 2.3.2-2. The applicant identified that LRA Section 2.1.4.1 states that the active or passive component determinations are based on the guidance provided in NEI-95-10, Appendix B. NEI-95-10, Appendix B, clarifies that for a pump category, the structure, component, or commodity group that meets the criterion of 10 CFR 54.21(a)(1)(i) is the pump casing. It also states that for a valve category, the structure, component, or commodity group that meets the criterion of 10 CFR 54.21(a)(1)(i) is the valve body. The applicant clarified that the pump casings and valve bodies that are subject to an AMR have been included within the scope of license renewal as component types of pump and valve in LRA Table 2.3.2-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.2-1 acceptable because it clarified that all applicable pump casings and valve bodies of the containment spray system are included within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.2-1 is resolved.

In RAI 2.3.2.2-2 dated April 18, 2007, the staff stated that USAR Section 6.2.2.1.2.2 describes the mechanical components in the containment recirculation sumps. It states that a "baffle arrangement of grating, coarse screening and fine screening that completely surrounds the sumps to prevent floating debris and high density particles from entering." However, the staff noted that these baffle arrangements and their intended functions are not listed in LRA Table 2.3.2-2. The staff requested that the applicant justify the exclusion of these components from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the associated components are addressed in LRA Section 2.3.2.11 under the residual heat removal (RHR) system. The baffle arrangements of screens for the containment recirculation sumps are included within the scope of license renewal and are listed in LRA Table 2.3.2-11 under the component type of screen with an intended function of filter. The applicant stated that each train of RHR and containment spray uses the same containment recirculation sump. The WCGS drawings and equipment list assign the screens to the RHR system.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.2-2 acceptable because it clarified that all applicable screen baffle arrangements of the containment spray system are within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.2-2 is resolved.

In RAI 2.3.2.2-3 dated April 18, 2007, the staff stated that USAR Section 6.2.5.2.2.2 indicates that the containment spray system is one element of a complement of factors and systems that ensure uniform mixing of hydrogen within the containment atmosphere following a LOCA. However, the staff noted that LRA Section 2.3.2.2 does not mention this function. The staff requested that the applicant clarify this inconsistency.

In its response dated May 2, 2007, the applicant stated that a sentence will be added to the system function description in LRA Section 2.3.2.2 to state that the containment spray system cools containment air and causes it to drop to lower elevations causing some hydrogen mixing to occur. By letter dated August 31, 2007, the applicant amended the LRA to included this statement.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.2-3 acceptable because it clarified that the system function in question was inadvertently omitted from the LRA. The applicant amended the LRA accordingly. Therefore, the staff's concern described in RAI 2.3.2.2-3 is resolved.

2.3.2.2.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the containment spray 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).

2.3.2.3 Containment Integrated Leak Rate Test System

2.3.2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.2.3 describes the containment integrated leak rate test system, which has a containment integrity function accomplished by normally-installed blank flanges inboard and outboard of all containment integrated leak rate test system penetrations (through the containment wall) and by manual valves in lines branching from the volume between the inboard and outboard blank flanges. The containment integrated leak rate test system is used periodically to test containment leakage by pressurizing the containment building and monitoring leakage to the atmosphere. The system consists of air compressors, filters, dryers, instrumentation, piping, and valves for delivering compressed air to the containment to conduct the test; however, the applicant has decided to use temporary air compressors as pressurization sources for containment leak rate testing. The system containment penetrations are isolated with blank flanges during normal plant operation and form part of the containment boundary.

The containment integrated leak rate test system has safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.3.2-3 identifies containment integrated leak rate test system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping
- valve

The intended function of the containment integrated leak rate test system component types within the scope of license renewal is to provide a pressure boundary.

2.3.2.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.3 and USAR Sections 6.2, 6.2.4, and 6.2.6.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.3 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.2.3-1 dated April 18, 2007, the staff requested that the applicant clarify if the valve bodies in the containment integrated leak rate test system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-GP-M-12GP01 are included in the component types listed in LRA Table 2.3.2-3. The applicant clarified that "valve body" was included within the category or commodity group of valve.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.3-1 acceptable because it clarified that all applicable valve bodies in the containment integrated leak rate testing system are within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.3-1 is resolved.

2.3.2.3.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the containment integrated leak rate test 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).

2.3.2.4 Decontamination System

2.3.2.4.1 Summary of Technical Information in the Application

LRA Section 2.3.2.4 describes the decontamination system, which (portions of the decontamination system) provides containment isolation for reactor vessel head decontamination penetration P-43. The system decontaminates removable components in the hot machine shop in the auxiliary building and supplies water to the cask wash-down pit in the fuel building. The decontamination system consists of a cask wash-down pit in the fuel building, wash tanks, pumps, filters, spray booth, ultrasonic generator, turbulator, piping, and valves.

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

LRA Table 2.3.2-4 identifies decontamination system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping
- valve

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

- pressure boundary
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.4 and USAR Section 12.3.1.1.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.4 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 2.3.2.4-1 dated April 18, 2007, the staff requested that the applicant clarify if the valve bodies in the decontamination system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-HD-M-12HD01 are included in the component types listed in LRA Table 2.3.2-4. The applicant clarified that "valve body" was included within the category or commodity group of valve.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.4-1 acceptable because it clarified that all applicable valve bodies in the decontamination system are within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.4-1 is resolved.

In RAI 2.3.2.4-2 dated April 18, 2007, the staff stated that LRA drawing LR-WCGS-HD-M-12HD01 shows 1-inch test connections (attached to 016-HBD-2 and 017-HBD-2) not highlighted in green. The staff noted that this would indicate that these 1-inch test connections are not within the scope of license renewal and not subject to an AMR. The two 2-inch pipes shown in the drawing have an intended function of structural integrity. The staff requested that the applicant clarify whether the 1-inch test connections have the same intended function as the 2-inch pipes. If yes, the staff requested that the applicant justify their exclusion from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the red highlighted 2-inch piping on the boundary drawing is within the scope of license renewal for structural integrity. The structural integrity intended function ends at a seismic anchor on the 2-inch piping. The 1-inch test connection piping attaches to the 2-inch structural integrity piping and is unsupported, independent of the structural integrity piping. The applicant clarified that the 1-inch test connection piping does not perform a structural integrity intended function but only adds load for the 2-inch structural integrity piping. This piping configuration has been analyzed in the 2-inch structural integrity piping support calculation.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.4-2 acceptable because it explains that the 1-inch test connections perform no structural integrity intended function and; thus, are not within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.2.4-2 is resolved.

2.3.2.4.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the decontamination 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).

2.3.2.5 Liquid Radwaste System

2.3.2.5.1 Summary of Technical Information in the Application

LRA Section 2.3.2.5 describes the liquid radwaste system, which provides containment isolation for penetrations P-26 (reactor coolant drain tank discharge) and P-44 (reactor coolant drain tank vent). The liquid radwaste system collects, segregates, processes, and recycles both reactor-grade and nonreactor-grade liquid wastes during plant power, refueling, and maintenance operations. Specifically, it handles potentially radioactive floor and equipment drains, laundry, and chemical waste. The processed liquid radwaste may be either stored for reuse within the plant or discharged to the environment.

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

LRA Table 2.3.2-5 identifies liquid radwaste system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow element
- heat exchanger shell side
- heat exchanger tube side
- heater
- instrument bellows
- piping
- pump
- tank
- thermowell
- tubing
- valve

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

- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.5 and USAR Section 11.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.5 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.2.5-1 dated April 3, 2007, the staff stated that the piping from the discharge of the reactor makeup water transfer pump is highlighted in the license renewal drawings as a nonsafety-related component affecting a safety-related component based on structural integrity of the piping lines. The staff noted that it is unclear where the boundary ends in the piping run going to the demineralized water degasifier. The staff requested that the applicant identify where the piping physically transitions from piping that is within the scope of license renewal to piping that is outside the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that license renewal boundary drawing LR-WCGS-HB-M-12HB03 showing the liquid radwaste system components in question, indicates that the piping and associated valves at coordinates A-5 and B-5 are within the scope of license renewal based upon the 10 CFR 54.4(a)(2) criteria for spatial interaction (vs. structural integrity consideration). The applicant further explained that the liquid radwaste system piping line 211-HCD-3 leaves the auxiliary building BLA 134 and enters the turbine building BLA 431. Additionally, the applicant stated that since the turbine building has no safety-related components, the spatial interaction ends where the piping leaves the auxiliary building.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.5-1 acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Therefore, the staff's concern described in RAI 2.3.2.5-1 is resolved.

2.3.2.5.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the liquid radwaste 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).

2.3.2.6 Reactor Makeup Water System

2.3.2.6.1 Summary of Technical Information in the Application

LRA Section 2.3.2.6 describes the reactor makeup water system, which provides containment isolation for penetration P-25. The reactor makeup water system stores deaerated water for use upon demand within the plant and receives filtered, deaerated, demineralized water from the demineralized water storage and transfer system. The reactor makeup water system consists of one storage tank, two transfer pumps, a tank steam coil heater, piping, valves, and instrumentation.

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

LRA Table 2.3.2-6 identifies the reactor makeup water system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- orifice
- piping
- pump
- tubing
- valve

The intended functions of the reactor makeup water system component types within the scope of license renewal include:

- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.6 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.6 identified an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to the staff's RAI as discussed below.

In RAI 2.3.2.6-1 dated May 6, 2007, the staff noted that in LRA Section 2.3.2.6, the applicant states that the reactor makeup water system provides containment isolation for penetration P-25. The staff requested that the applicant identify the components affected by the containment isolation. In addition, the staff requested that the applicant clarify if these components are within the scope of license renewal.

In its response dated June 1, 2007, the applicant stated that the components affected by the containment isolation associated with penetration P-25 are the line segment and the associated drain between the isolation valves. These components are shown as green on drawing LR-WCGS-BLM-12BL01. The applicant clarified that the components affected by containment isolation have a pressure boundary intended function and are within the scope of license renewal based on the requirements of 10 CFR 54.4(a)(1). The applicant further stated that other portions of the reactor water makeup system are within the scope of license renewal for structural integrity and spatial interaction based on the requirements of 10 CFR 54.4(a)(2) and are shown in red in the drawing.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.6-1 acceptable because it clarified that the line segment and the associated drain between the isolation valves are within the scope of license renewal. In addition, the applicant demonstrated that it considered components that could be affected due to structural integrity and spatial interaction as required by 10 CFR 54.4(a)(2). Therefore, the staff's concern described in RAI 2.3.2.6-1 is resolved.

2.3.2.6.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor makeup water 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).

2.3.2.7 Containment Purge HVAC System

2.3.2.7.1 Summary of Technical Information in the Application

LRA Section 2.3.2.7 describes the containment purge HVAC system, which provides containment isolation through two valves at each penetration for isolation function redundancy. The common intake provides air and tornado isolation. The unit vent provides a common monitored vent path and tornado protection, for various essential and nonessential HVAC systems. The containment purge HVAC system ventilates the containment for habitability when required and provides a vent path to equalize containment and atmospheric pressures. The containment mini-purge subsystem removes noble gas from the containment before and during personnel access to the containment in modes 1, 2, 3 and 4 and equalizes containment internal pressure with the external pressure in modes 1, 2, 3 and 4.

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

LRA Table 2.3.2-7 identifies containment purge HVAC system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper
- ductwork
- flex connector
- heat exchanger tube side
- piping
- pump
- tubing
- valve

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

- rated fire barrier to confine or retard a fire from spreading
- spray shield, curbs, or mechanical components for directing flow
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.7 and USAR Sections 7.3.2, 9.4.1.2.2, 9.4.3.1.1, and 9.4.6.1.1 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.7 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 2.3.2.7-1 dated April 18, 2007, the staff requested that the applicant clarify if the damper housings, pump casings, and valve bodies in the containment purge HVAC system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-GT-M-12GT01 are included in the component types listed in LRA Table 2.3.2-7. The applicant clarified that the pump casing and valve body are included within the categories or commodity groups of pump and valve, respectively. It also clarified that the dampers are included within the valve category and that the structure, component, or commodity group that meets the requirements of 10 CFR 54.21(a)(1)(i) is the damper housing.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.7-1 acceptable because it clarified that all applicable pump casings, valve bodies, and damper housings in the containment purge HVAC system are within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.7-1 is resolved.

In RAI 2.3.2.7-2 dated April 18, 2007, the staff noted that LRA drawing LR-WCGS-GT-M-12GT01 does not highlight the safety-related and nonsafety-related interfaces (i.e., green to red) as within the scope of license renewal. However, LRA Table 2.3.2-7 shows structural integrity as an intended function for piping components in the system. The staff requested that the applicant explain why this interface is not highlighted in the drawing. If this interface is not within the scope of license renewal, the staff requested that the applicant provides a justification for its exclusion.

In its response dated May 2, 2007, the applicant stated that there are seven locations on drawing LR-WCGS-GT-M-12GT01, at coordinates D-7, F-2, F-6, F-7, and G-6, that depict green HVAC ducting attached to non-highlighted HVAC ducting. The applicant clarified that this is correct as shown. The green HVAC ducting is safety-related Seismic Category 1 and is self-supporting under accident conditions. The applicant also stated that the attached nonsafety-related (non-highlighted) HVAC ducting does not provide additional support for the safety-related ducting because sheet metal ducting does not have the strength capability and, therefore, does not have a structural integrity intended function.

The applicant further stated that there are six locations on boundary drawing LR-WCGS-GT-M-12GT01, at coordinates A-5, A-6, C-4, C-5, C-6, and E-4, that depict green HVAC piping attached to non-highlighted HVAC piping. The attached nonsafety-related piping should have been shown in the drawing as structural integrity and highlighted in red. On boundary drawing LR-WCGS-GT-M-12GT01 the additional nonsafety-related piping that should be highlighted in red is piping up to the 5NL boundary, which is the point where nonsafety-related HVAC ducting begins. Valves V0017, V0018, V0019, V0020, V0021, and V0022 and associated 3/4-inch piping have no supports on these sections that contribute to the structural integrity intended function. The applicant clarified that an LRA amendment is not necessary because the LRA already lists the component types in question in LRA Tables 2.3.2-7 and 3.2.2-7.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.7-2 acceptable because it clarified that these components are within the scope of license renewal, that this was a highlighting error, and that license renewal drawing LR-WCGS-GT-M-12GT01 will be revised accordingly. Therefore, the staff's concern described in RAI 2.3.2.7-2 is resolved.

In RAI 2.3.2.7-3 dated April 18, 2007 the staff noted that LRA Table 2.3.2-7 lists pressure boundary as an intended function for the component type of tubing. However, LRA drawing LR-WCGS-GT-M-12GT01 shows a 3/8-inch tubing located at heat exchanger No. 14 (at valves V0220 and V0221) which suggests a leakage boundary (spatial) intended function. The staff requested that the applicant clarify this discrepancy.

In its response dated May 2, 2007, the applicant agreed with the staff and stated that the 3/8-inch tubing and the associated valves V0220 and V0221, located at coordinate C-3, have an intended function of leakage boundary (spatial). LRA Tables 2.3.2-7 and 3.2.2-7 will be revised to include the intended function of leakage boundary (spatial) for the component type of tubing. By letter dated August 31, 2007, the applicant amended the application to include these changes.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.7-3 acceptable because it clarified the discrepancies. In addition, the applicant adequately amended the LRA to incorporate these changes. Therefore, the staff's concern described in RAI 2.3.2.7-3 is resolved.

2.3.2.7.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the containment purge HVAC 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).

2.3.2.8 Breathing Air System

2.3.2.8.1 Summary of Technical Information in the Application

LRA Section 2.3.2.8 describes the breathing air system, which provides containment isolation for piping penetration P-98 and clean, purified breathing air for personnel using respiratory protection and body cooling equipment in radiologically-controlled areas. The system consists of compressors, receivers, filters, dryers, instrumentation, piping, and valves.

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

LRA Table 2.3.2-8 identifies breathing air system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping
- valve

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

- pressure boundary
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.8.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.8 and USAR Section 9.5.10 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.8 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 2.3.2.8-1 dated April 18, 2007, the staff requested that the applicant clarify if the valve bodies in the breathing air system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-KB-M-12KB01 are included in the component types listed in LRA Table 2.3.2-8. The applicant clarified that the valve bodies are included within the category or commodity group of valve.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.8-1 acceptable because it clarified that all the applicable valve bodies in the breathing air system are within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.8-1 is resolved.

In RAI 2.3.2.8-2 dated April 18, 2007, the staff stated that license renewal drawing LR-WCGS-KB-M-12KB01 shows 1-inch test connections 004-HCD-1 and 005-HCD-1 not highlighted, indicating that these are not within the scope of license renewal and not subject to an AMR. The staff noted that test connection 004-HCD-1 attaches to 002-HCD-2, and test connection 005-HCD-1 attaches to 003-HCD-2. As indicated in LRA Table 2.3.2-8 and by the red highlight shown in the drawing, pipes 002-HCD-2 and 003-HCD-2 have an intended function of structural integrity (connection attachment) in accordance with 10 CFR 54.4(a)(2). The staff requested that the applicant explain why test connections 004-HCD-1 and 005-HCD-1 and their attendant valves are not within the scope of license renewal and, therefore, subject to an AMR.

In its response dated May 2, 2007, the applicant stated that the red highlighted 2-inch piping on the boundary drawing is within the scope of license renewal for structural integrity. The structural integrity intended function ends at a seismic anchor on the 2-inch piping. The 1-inch test connection piping attaches to the 2-inch structural integrity piping and is unsupported independent of the structural integrity piping. The applicant clarified that the 1-inch test connection piping does not perform a structural integrity intended function but only adds load for the 2-inch structural integrity piping. This piping configuration has been analyzed in the 2-inch piping support calculation.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.8-2 acceptable because it clarified that the 1-inch test connections perform no structural integrity intended function. Thus, these 1-inch test connections should not be within the scope of license renewal and should not be subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.8-2 is resolved.

2.3.2.8.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the breathing air 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).

2.3.2.9 Hydrogen Control System

2.3.2.9.1 Summary of Technical Information in the Application

LRA Section 2.3.2.9 describes the hydrogen control system, which maintains the containment atmosphere hydrogen concentration less than 4.0 percent by volume following a LOCA with two redundant thermal hydrogen recombiners located in containment. A sampling subsystem monitors the containment atmosphere and draws samples. A purge path provides a backup in the unlikely event the recombiners are unable to maintain the containment atmosphere hydrogen concentration of less than 4 percent by volume. The containment design assures adequate mixing to prevent formation of hydrogen pockets without reliance on mixing fans. Containment isolation is provided by two valves each at penetrations P-56, P-65, P-97, P- 99, and P-101. The system consists of the electric hydrogen recombiners, the hydrogen analyzers, the hydrogen purge exhaust path, and the hydrogen mixing fans. The electric recombiners, located in containment, heat the containment atmosphere causing hydrogen to recombine thermally with oxygen. Hydrogen monitoring is performed by hydrogen analyzers and sample lines with their containment isolation valves. The hydrogen purge exhaust path consists of one penetration through which the containment atmosphere is vented and filtered. Hydrogen mixing fans draw air from each steam generator compartment and discharge it toward the upper regions of the containment.

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

LRA Table 2.3.2-9 identifies hydrogen control system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- orifice
- piping
- recombiner
- sample vessel
- tubing
- valve

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

- spray shield, curbs, or mechanical components for directing flow
- pressure boundary
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.9.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.9 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.2.9 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 2.3.2.9-1 dated April 18, 2007, the staff requested that the applicant clarify if the valve bodies or recombiner housings in the hydrogen control system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-GS-M-12GS01 are included in the component types listed in LRA Table 2.3.2-9. The applicant clarified that the valve bodies are included within the category or commodity group of valve.

The applicant also stated that USAR Section 6.2.5.2.2.1 indicates that the function of the hydrogen recombiners is based on passive natural circulation of the air flow. The applicant clarified that in accordance with the guidance provided in NEI 95-10, Appendix B, item 66, the portions of the recombiners, including the enclosure that have the passive intended function of maintaining natural circulation flow, were included within the scope of license renewal and listed in LRA Table 2.3.2-9 under the component type of recombiner, with an intended function of direct flow.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.9-1 acceptable because it clarified that all applicable valve bodies and recombiner housings associated with the hydrogen control system are within the scope of license renewal and are subject to an AMR. Therefore, the staff's concern described in RAI 2.3.2.9-1 is resolved.

In RAI 2.3.2.9-2 dated April 18, 2007, the staff stated that USAR 6.2.5.2.2.2 states that one of the hydrogen control system functions is to uniformly mix the hydrogen within the containment atmosphere following a LOCA. However, the staff noted this is not addressed in the system description of LRA Section 2.3.2.9. Furthermore, there is no mention of this uniform mixing of hydrogen function in LRA Section 2.3.3.5, "Containment Cooling System." The staff requested that the applicant clarify these inconsistencies.

In its response dated May 2, 2007, the applicant noted that USAR Section 6.2.5.2.2.2 and LRA Section 2.3.2.9 state that the containment design is such that mixing, adequate to prevent formation of hydrogen pockets, is assured without reliance of the hydrogen control system mixing fans. The applicant stated that a sentence will be added to the system function description in LRA Section 2.3.3.5 stating that some hydrogen mixing will occur as the containment air coolers take suction from above the operating floor level and discharge to the lower levels of the containment. By letter dated August 31, 2007, the applicant amended the LRA to incorporate this change.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.9-2 acceptable. Upon further review the staff agrees with the applicant and finds that the comprehensive wording of LRA Section 2.3.2.9 captures the containment uniform mixing hydrogen function. In addition, the applicant has adequately amended LRA Section 2.3.3.5 to include a uniform mixing hydrogen function in the system description. Therefore, the staff's concerns described in RAI 2.3.2.9-2 is resolved.

In RAI 2.3.2.9-3 dated April 18, 2007, the staff stated that LRA Table 2.3.2-9 indicates that portions of the piping subject to an AMR have a structural integrity (attached) intended function. However, the staff noted that the system function described in LRA Section 2.3.2.9 does not indicate that portions of the hydrogen control system are within the scope of license renewal in accordance with the 10 CFR 54.4(a)(2) criteria. The staff requested that the applicant clarify this inconsistency.

In its response dated May 2, 2007, the applicant stated that the scoping results of the hydrogen control system will be amended to clarify that portions of the hydrogen control system are within the scope of license renewal as nonsafety-related component affecting safety-related components based on the criterion of 10 CFR 54.4(a)(2). By letter dated August 31, 2007, the applicant amended LRA Section 2.3.2.9 to include this change.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.9-3 acceptable because it adequately amended the scoping results of the hydrogen control system. Therefore, the staff's concern described in RAI 2.3.2.9-3 is resolved.

In RAI 2.3.2.9-4 dated April 18, 2007, the staff noted that LRA drawing LR-WCGS-GS-M-12GS01 appears to have at least one piping segment that has a structural integrity (attached) intended function pursuant to 10 CFR 54.4(a)(2). For example, pipe 026-HB0-6, located at coordinate F-4 downstream of the seismic flag at butterfly valve V021, appears to be a carbon steel pipe with a structural integrity (attached) intended function. This would be in agreement with LRA Table 2.3.2.9. However, there are multiple occurrences of what appears to be stainless steel test connections beyond the seismic anchor point identified on the drawing. The staff noted that in most cases it is not obvious whether the test connection is stainless steel pipe or tubing. At coordinates B-3 and B-7, there is stainless steel tubing connected beyond the seismic anchor valves V0109 and V010, which appear to be safety-related to nonsafety-related interfaces. The staff requested that the applicant clarify whether the component type tubing should also include a structural integrity (attachment) intended function. In addition, the staff requested that the applicant clarify similar inconsistencies in LRA Section 2.3.2.9 and its drawing.

In its response dated May 2, 2007, the applicant stated that the piping segment 026-HB0-6, located at coordinate F-4 downstream of the butterfly valve V021, has an intended function of structural integrity (attached). The drawing should have shown the correct intended function for this piping segment. However, the applicant clarified that LRA Table 2.3.2-9 will not be affected as a result of this change.

The applicant also stated that the piping segment downstream of valve V0041, located at coordinate F-4, has no function of structural integrity (attached). Therefore, the segment is not highlighted. The applicant stated that most of the test connection piping segment downstream of the isolation valves with intended function of structural integrity (attached) are stainless steel pipe Class HCD. However, two segments, at coordinates B-3 and B-7 downstream of the valves V0109 and V0108, are stainless steel tubing. The applicant stated that LRA Tables 2.3.2-9 and 3.2.2.-9 will be revised to include the function of structural integrity (attached) for component type of tubing. By letter dated August 31, 2007, the applicant amended the LRA to include these changes.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.9-4 acceptable because it clarified that the missing intended function for piping segment 026-HB0-6 was a drawing highlighting error. In addition, the applicant amended the LRA to include the intended function of structural integrity (attached) for the component type of stainless steel tubing. Therefore, the staff's concern described in RAI 2.3.2.9-4 is resolved.

2.3.2.9.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the hydrogen control 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).

2.3.2.10 High Pressure Coolant Injection System

2.3.2.10.1 Summary of Technical Information in the Application

LRA Section 2.3.2.10 describes the high pressure coolant injection system, which provides core cooling, inventory control, and reactivity control to the RCS in DBEs. The high pressure coolant injection system provides containment isolation for penetrations P-45, P-48, P-49, P-58, P-87, P-88 and P-92. The high pressure coolant injection system includes the borated refueling water storage and the accumulator safety injection systems. The high pressure coolant injection system is a portion of the emergency core cooling system (ECCS) and consists of the safety injection pumps, boron injection tank, piping, valves, and instrumentation. The borated refueling water storage system provides treated borated water for the ECCS and the containment spray system during DBEs and refueling operations. The borated refueling water storage system consists of the RWST, piping, valves, and instrumentation. The accumulator safety injection system, which injects treated borated water into the RCS by pressurized nitrogen gas, consists of four tanks (accumulators) containing borated water pressurized with nitrogen, piping, valves, and instrumentation.

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

LRA Table 2.3.2-10 identifies high pressure coolant injection system component types within the scope of license renewal and subject to an AMR:

- accumulator
- Class 1 piping (less than or equal to 4 inches)
- closure bolting
- filter
- flow element
- heat exchanger shell side
- heat exchanger tube side
- instrument bellows
- orifice
- piping
- pump
- sight gauge
- tank
- thermowell
- tubing

- valve

The intended functions of the high pressure coolant injection system component types within the scope of license renewal include:

- filtration
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.10.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.10 and USAR Section 6.3 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 finds that large portions of the high pressure coolant injection system, especially the sections that are connected to the RCS, are within the scope of license renewal as required by 10 CFR 54.4(a)(1), since the system performs important safety functions needed to mitigate certain DBAs. Also, the nonsafety-related components are within the scope of license renewal since they could affect safety-related components for structural integrity and spatial interaction. In addition, the high pressure coolant injection system supports fire protection and EQ requirements, which are considered within the scope of license renewal as required by 10 CFR 54.4(a)(3).

The staff's review of LRA Section 2.3.2.10 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 2.3.2.10-1 dated May 6, 2007, the staff noted that license renewal drawing LR-WCGS-EM-M-12EM01 shows the RWST within the scope of license renewal. However, the piping and components EBN01A, EBN01B and EBN01C, which are surrounded by this tank, are not. The staff requested that the applicant justify why these components are not within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(2).

In its response dated June 1, 2007, the applicant noted that USAR 6.3.2.2 states that the heat exchangers (i.e., steam heating coils EBN01A, EBN01B, and EBN01C) are wrapped around the exterior shell of the tank. The steam heating coils are under the insulation that is also wrapped around the outside of the tank. The applicant clarified that steam heating coils are not enclosed internally in the tank (enclosed by insulation). The applicant clarified that the nonsafety-related steam heating coils attached to the exterior shell of the tank may have spatial interactions with the safety-related tank and its associated instrumentation in an event of heating coil leak. The applicant stated that the steam heating coils will be included within the scope of license renewal as required by 10 CFR 54.4(a)(2). The applicant also stated that drawing LR-WCGS-EM-M-12BN01 will be revised to show the steam heating coils EBN01A, EBN01B, and EBN01C and their associated piping within the scope of license renewal.

By letter dated August 31, 2007, the applicant amended LRA Table 2.3.2-10 to include the steam heating coils under the component type of heat exchanger tube side with an intended function of leakage boundary. In addition, LRA Table 3.2.2-10 was amended to include the aging evaluation for the component type of heat exchanger tube side.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.10-1 acceptable because the applicant adequately included these heating coils within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.2.10-1 is resolved.

2.3.2.10.3 Conclusion

The staff reviewed the LRA as amended, USAR, drawings, and RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the high pressure coolant injection 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).

2.3.2.11 Residual Heat Removal System

2.3.2.11.1 Summary of Technical Information in the Application

LRA Section 2.3.2.11 describes the RHR system, which provides borated water for RCS makeup in LOCA conditions and for decay heat removal in post-accident conditions. Containment isolation valves, suction line guard pipes, and valve encapsulations maintain containment integrity in single-failure scenarios. The system is also used for shutdown cooling in nonaccident conditions to remove decay heat. The system consists of two redundant trains, each of which has a containment recirculation sump, RHR pump, heat exchanger, valves, and piping. Suction paths are provided from the RWST for safety injection flow and from the containment recirculation sumps for long-term post-LOCA decay heat removal. Each train has a discharge path to both hot and cold legs.

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

LRA Table 2.3.2-11 identifies RHR system component types within the scope of license renewal and subject to an AMR:

- Class 1 piping (less than or equal to 4 inches)
- closure bolting
- expansion joint
- flow element
- heat exchanger shell side
- heat exchanger tube side
- insulation
- orifice
- piping
- pump
- screen
- spacer ring
- tank
- thermowell
- tubing
- valve
- vortex breaker

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

- flow restriction
- spray shield, curbs, or mechanical components for directing flow
- filtration
- heat transfer
- heat loss control
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- structural and/or functional support to safety-related components
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.2.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.2.11 and USAR Sections 5.4.7 and 6.3 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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).

2.3.2.11.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RHR 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 Auxiliary Systems

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

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

- 2.3.3.1 fuel handling - fuel storage and handling system
- 2.3.3.2 fuel pool cooling and cleanup system
- 2.3.3.3 essential service water
- 2.3.3.4 component cooling water system
- 2.3.3.5 containment cooling system
- 2.3.3.6 compressed air system
- 2.3.3.7 chemical and volume control system
- 2.3.3.8 auxiliary building HVAC system
- 2.3.3.9 control building HVAC system
- 2.3.3.10 fuel building HVAC system
- 2.3.3.11 essential service water pumphouse building HVAC system
- 2.3.3.12 miscellaneous buildings HVAC system
- 2.3.3.13 diesel generator building HVAC system
- 2.3.3.14 fire protection system
- 2.3.3.15 emergency diesel engine fuel oil storage and transfer system
- 2.3.3.16 emergency diesel engine system
- 2.3.3.17 floor and equipment drains system
- 2.3.3.18 oily waste system

- 2.3.3.19 cranes, hoists, and elevators system
- 2.3.3.20 turbine building HVAC system
- 2.3.3.21 systems within the scope of license renewal based only on the criterion of 10 CFR 54.4(a)(2)

The staff's review findings regarding LRA Sections 2.3.3.1 – 2.3.3.21 are presented in SER Sections 2.3.3.1 – 2.3.3.21, respectively.

2.3.3.1 Fuel Handling - Fuel Storage and Handling System

2.3.3.1.1 Summary of Technical Information in the Application

LRA Section 2.3.3.1 describes the fuel handling - fuel storage and handling system, which provides onsite storage of new and spent fuel assemblies to maintain a sub-critical arrangement under normal and postulated accident conditions. The fuel handling system allows for manipulation of the fuel during receipt, inspection, storage, refueling, and ship-out. Reactor servicing consists of those operations necessary to support refueling, maintenance, and inservice inspection. The system consists of machines, devices, cranes, elevators, transfer systems, fixtures, tooling, and storage racks. Crane rails and their supports are evaluated with their appropriate structures.

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

LRA Table 2.3.3-1 identifies fuel handling - fuel storage and handling system component types within the scope of license renewal and subject to an AMR:

- crane
- fuel handling equipment
- neutron absorbers (Boral)
- new fuel racks
- spent fuel racks

The intended functions of the fuel handling - fuel storage and handling system component types within the scope of license renewal include:

- absorb neutrons
- missile barrier
- pressure boundary
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.1 and USAR Sections 9.1.1, 9.1.2, 9.1.4, 15.7.4, and 15.7.5 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.1 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 2.3.3.1-1 dated April 3, 2007, the staff stated that a license renewal drawing depicts the layout of the spent fuel pool, cask loading pit, and the fuel transfer canal. Additionally, these three areas are shown to be adjacent and separated by walls, except in two slots that are sealed off by spent fuel gates. The staff noted that USAR Section 9.1.2.2, describes the leaktight gates in the spent fuel pool and their functions which includes allowing drainage of the cask loading pit and fuel transfer canal while maintaining the proper water inventory in the spent fuel pool. The staff noted that the USAR states that an acceptable minimum water level will be maintained in the event of loss of integrity of the gate while either the cask loading pit or fuel transfer canal is drained. Additionally, the staff noted that LRA Section 2.3.3.1 does not include the spent fuel gates within the scope of license renewal. As the spent fuel gates appear to be required as a pressure boundary to maintain correct water level above the spent fuel when the cask loading pit and the fuel transfer canal are drained, the staff requested that the applicant justify the exclusion of the spent fuel gates and their sealing mechanisms from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the WCGS Engineering Department has verified that simultaneous loss of both spent fuel gates, while both adjacent fuel-handling areas are drained, would not result in draining the pool down to an unacceptable limit. Further, the applicant explained that this evaluation conforms with the Regulatory Position C.6 described in RG 1.13, Revision 1, which states that systems for maintaining water quantity should be designed so that any mal-operation or failure of such systems will not cause fuel to be uncovered. The applicant explained that USAR Table 9.1-3, paragraph 6, confirms that the WCGS design complies with this guidance and that the spent fuel gates are not required as a pressure boundary component to maintain correct water level above the spent fuel when the cask loading pit and the fuel transfer canal are drained, and aging management of the gates and seals is not required.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.1-1 acceptable because it provided clarification to the statement in the USAR that adequately addresses the question regarding the spent fuel gates. Therefore, the staff's concern described in RAI 2.3.3.1-1 is resolved.

2.3.3.1.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the fuel handling - fuel storage and handling 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).

2.3.3.2 Fuel Pool Cooling and Cleanup System

2.3.3.2.1 Summary of Technical Information in the Application

LRA Section 2.3.3.2 describes the fuel pool cooling and cleanup (FPCC) system, which maintains the fuel storage pool water temperature below prescribed limits by removing decay heat generated by stored spent fuel assemblies. Heat is transferred from the fuel storage pool water to the component cooling water system (CCWS). If system cooling is lost, two redundant feeds from the emergency service water system can provide water directly to the spent fuel pool to maintain level (pool water boils off) and cool the spent fuel assemblies. FPCC system components for containment isolation include the fuel transfer tube and three piping penetrations for the refueling pool supply, suction, and skimmer. The FPCC system removes decay heat from the stored spent fuel and maintains purity and optical clarity of the water in the spent fuel pool, the fuel transfer canal, and the refueling canal. The system consists of a fuel pool cooling loop with pumps, heat exchangers, strainers, piping, and valves, a fuel pool cleanup loop with pumps, filters, demineralizer, strainers, piping, and valves, and a fuel pool surface skimmer loop with skimmers, pump, piping, and valves.

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

LRA Table 2.3.3-2 identifies FPCC system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow element
- expansion joint bellows
- heat exchanger shell side
- heat exchanger tube side
- penetrations mechanical
- piping
- pump
- thermowell
- tubing
- valve

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

- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.2 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.2 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 2.3.3.2-1 dated April 3, 2007, the staff stated that a normally closed valve (V0995) at the spent fuel pool fuel end of the fuel transfer tube is shown on a license renewal drawing. Further, the staff noted that the fuel transfer tube is designated as being safety-related and within the scope of license renewal for providing a pressure boundary. However, the staff stated that the valve is not listed as being within the scope of license renewal. The staff requested that the applicant justify the exclusion of this valve from the scope of license renewal as it provides structural support for the fuel transfer tube and meets the criterion of 10 CFR 54.4(a)(2).

In its response dated May 2, 2007, the applicant stated that the nonsafety-related valve V0995, which is attached to the fuel transfer tube in the fuel building, does not provide structural integrity to the fuel transfer tube. The applicant further stated that a floating saddle provides support for the fuel transfer tube and for valve V0995, which is attached to the end of the fuel transfer tube. Therefore, valve V0995 does not provide structural integrity to attached safety-related equipment and has no intended functions in accordance with 10 CFR 54.4(a).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-1 acceptable because it adequately explained the structural support mechanism and that the saddle is designed to support the fuel transfer tube, not the valve V0995. Therefore, the staff's concern described in RAI 2.3.3.2-1 is resolved.

In RAI 2.3.3.2-2 dated April 3, 2007, the staff stated that removable spools with spacer rings installed are shown on a license renewal drawing. The staff noted that the spacer rings are replacements for startup strainers. Additionally, the staff noted that although the piping lines in which the spacer rings are installed are highlighted in the drawing as being within the scope of license renewal, the spacer rings are not listed in LRA Table 2.3.3-2. The staff requested that the applicant justify the exclusion of these components from LRA Table 2.3.3-2.

In its response dated May 2, 2007, the applicant stated that spacer rings ECSS001SR and ECSS002SR were incorrectly excluded from the scope of license renewal. The applicant further explained that the spacer rings will be included within the scope of license renewal and will be given an intended function of pressure boundary, which is the intended function of their surrounding piping. By letter dated August 31, 2007, the applicant amended the LRA to include the component type spacer ring with an intended function of pressure boundary in LRA Tables 2.3.3-2 and 3.3.2-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-2 acceptable because it adequately explained that the spacer rings were inadvertently omitted from the scope of license renewal. Because the spacer rings have an intended function pursuant to 10 CFR 54.4(a) the applicant has made the appropriate changes in the LRA. Therefore, the staff's concern described in RAI 2.3.3.2-2 is resolved.

In RAI 2.3.3.2-3 dated April 3, 2007, the staff stated that strainers in the suction piping from the spent fuel pool to the spent fuel pool cooling pumps are shown on a license renewal drawing. Additionally, the staff noted that although the strainers are installed on lines that are highlighted in the drawing as within the scope of license renewal in accordance with 10 CFR 54.4(a)(1), the strainers are not highlighted. The staff requested that the applicant justify the exclusion of the strainers from the scope of license renewal even though failure of the strainers could cause damage to the pumps or valves and could prevent performance of the FPCC system intended functions.

In its response dated May 2, 2007, the applicant stated that strainers ECIS0001 and ECIS0002 must maintain their structure to prevent the potential damage of safety-related equipment. The applicant further explained that the strainers will be included within the scope of license renewal. By letter dated August 31 2007, the applicant amended the LRA to include the component type strainer with an intended function of nonsafety-related structural support in LRA Tables 2.3.3-2 and 3.3.2-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-3 acceptable because the strainers were inadvertently omitted from the scope of license renewal. In addition, the applicant has made the appropriate changes in the LRA. Therefore, the staff's concern described in RAI 2.3.3.2-3 is resolved.

2.3.3.2.3 Conclusion

The staff reviewed the LRA as amended, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the FPCC 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).

2.3.3.3 Essential Service Water

2.3.3.3.1 Summary of Technical Information in the Application

LRA Section 2.3.3.3 describes the essential service water system (ESWS), which provides filtered cooling water to transfer heat from plant components requiring cooling for safe reactor shutdown to the ultimate heat sink (UHS). The ESWS provides emergency makeup from the UHS to the fuel storage pool and CCWSs and is the backup water supply to the auxiliary feedwater system when CST water is unavailable. The ESWS also provides containment isolation for four system piping penetrations. The ESWS is an open-cycle system with two separate 100-percent capacity trains of traveling screens, pumps, pump pre-lube storage tanks, self-cleaning strainers, piping, valves, and instrumentation. One pump supplies cooling water to each flow path. Each flow path is fed from the UHS intake channel via separated forebays in the ESW pump house. Each train of the ESWS provides cooling water to the associated train of safety-related components. The heated water is discharged to the UHS via the ESWS discharge structure. Each system train connects with the nonsafety-related service water system. There are two motor-operated isolation valves for each crosstie header where it connects to the service water system.

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

LRA Table 2.3.3-3 identifies ESWS component types within the scope of license renewal and subject to an AMR:

- closure bolting
- filter
- flow element
- orifice
- piping
- pump
- strainer
- strainer element
- tank
- thermowell
- tubing
- valve

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

- flow restriction

- filtration
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components
- conversion of fluid into spray

2.3.3.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.3 and USAR Sections 1.2.9.4.2, 9.2.1.2, and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESWS 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).

2.3.3.4 Component Cooling Water System

2.3.3.4.1 Summary of Technical Information in the Application

LRA Section 2.3.3.4 describes the CCWS, which provides cooling water to transfer heat from engineered safety feature components requiring cooling for safe reactor shutdown to the ESWS. The CCWS also provides cooling water to the safety-related spent fuel pool heat exchangers and transfers sufficient heat energy to the ESWS for freeze protection for the ESWS intake structure. Frazil ice formation is inhibited by a warming line branching from each ESW return line supplying heated water to the intake structure. The CCWS also provides containment isolation for three system pipings penetrating containment barriers. The CCWS provides cooling water to engineered safety feature systems following DBEs and transfers the heat to the ESWS. The CCWS also provides cooling water to the safety-related spent fuel pool heat exchangers and transfers sufficient heat energy to the ESWS to protect the ESWS inlet trash racks from blockage by frazil ice. The CCWS consists of four circulating pumps, two heat exchangers, two surge tanks, one chemical addition tank, piping, valves, and instrumentation.

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

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

- closure bolting
- flow element
- heat exchanger shell side
- heat exchanger tube side
- piping
- pump
- sight gauge
- tank
- thermowell
- tubing
- valve

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

- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.4 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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).

2.3.3.4.3 Conclusion

The staff reviewed the LRA, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CCWS 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).

2.3.3.5 Containment Cooling System

2.3.3.5.1 Summary of Technical Information in the Application

LRA Section 2.3.3.5 describes the containment cooling system, which with the containment spray system removes decay heat from the containment atmosphere following a design basis LOCA or main steam line break inside the containment to keep the containment below the design pressure. Heat removed from the containment atmosphere by the containment coolers and transferred to the ESWS provides sufficient heat energy to protect the ESWS inlet trash racks from blockage by frazil ice. Freeze protection for the ESWS intake structure is by a warming line which branches from each ESW return line. The containment cooling system, which also provides containment isolation, consists of four containment coolers, cooling water piping, and valves.

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

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

- closure bolting
- heat exchanger shell side
- heat exchanger tube side
- instrument bellows
- piping
- thermowell
- tubing
- valve

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

- heat transfer
- pressure boundary
- structural and/or functional support to safety-related components

2.3.3.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.5 and USAR Sections 6.2.2.2, 9.2.1.2.2.3, 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.5 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 2.3.3.5-1 dated April 3, 2007, the staff stated that the containment coolers shown on a license renewal drawing are within the scope of license renewal because they are safety-related. Additionally, the staff noted that LRA Section 2.3.3.5 states that the containment cooling system, in conjunction with the containment spray system, removes sufficient energy and subsequent decay heat from the containment atmosphere following a design basis LOCA or a main steam line break inside the containment to maintain it below the design pressure. However, the staff noted that each of the containment coolers has drain lines attached to the cooler shell (air side) of the heat exchanger. Each of the drain lines pass through a drain trap and are not shown to be within the scope of license renewal, although they appear to support the system intended function of the containment coolers. The staff requested that the applicant justify the exclusion of the drain lines from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the containment cooling system design is described in USAR Section 6.2.2.2.3 which identifies adequate redundancy and that no single failure will compromise the system's safety functions. The applicant further stated that the three drain lines associated with each containment cooler are nonsafety-related and non-seismic and therefore cannot be credited to remain functional after a design basis accident. Additionally the applicant identified that the drain lines are sized to prevent flooding of cooling coils from condensation of the air-water vapor mixture and that the volume of water condensed by the cooling coils during a LOCA or main steam line break in containment does not hinder the cooling coil's ability to perform their intended function. The applicant also described the containment cooling unit's physical dimensions which supported its response.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-1 acceptable because it adequately explained that the design of the containment cooling coil drain lines do not perform any intended function pursuant to 10 CFR 54.4(a) and that their failure does not affect the containment cooling system's ability to perform its intended function. Therefore, the staff's concern described in RAI 2.3.3.5-1 is resolved.

In RAI 2.3.3.5-2 dated April 3, 2007, the staff noted that LRA Section 2.3.3.5 states that portions of the system support EQ in accordance with 10 CFR 54.4(a)(3). The staff also noted that although the containment coolers are within the scope of license renewal, the discharge ductwork from the containment coolers are excluded from the scope of license renewal. The staff believes that during normal operation the containment cooler discharge ductwork supplies cooled air to areas that contain safety-related equipment such as instrumentation adjacent to the steam generator compartments. The staff requested that the applicant justify the exclusion of the containment cooler discharge ductwork from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the containment cooler discharge ductwork is not credited in the USAR with a safety-related function and that the discharge ductwork is designed to remain functional during normal operation only. The applicant further explained that during accident conditions, the discharge ductwork is designed to automatically detach from the containment cooling fan through actuation of fusible link. Additionally, the applicant described the containment cooler's discharge ductwork's design specifications that confirmed the information in the USAR. In its response the applicant identified that containment temperatures are monitored and actuate alarms in the control room and that any failure of the discharge duct that resulted in elevated containment temperatures would be easily detected through technical specification surveillance.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-2 acceptable because it adequately explained that the containment cooler's discharge ductwork is not credited with supporting EQ requirements and that temperature monitoring is performed through technical specification surveillance. Therefore, the staff's concern described in RAI 2.3.3.5-2 is resolved.

2.3.3.5.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the containment cooling 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).

2.3.3.6 Compressed Air System

2.3.3.6.1 Summary of Technical Information in the Application

LRA Section 2.3.3.6 describes the compressed air system, which provides a safety-related backup supply of compressed nitrogen from the service gas system for operation of the auxiliary feedwater control valves and main steam atmospheric relief valves in case compressed air system instrument air is lost. Portions of the compressed air system provide containment isolation for instrument air piping penetration P-63 and service air penetration P-30. The compressed air system supplies both instrument air and service air for plant use. The system provides a continuous supply of filtered, oil-free air to a common header that branches into the instrument air and service air subsystems. Service air is distributed throughout the plant for normal maintenance services. Instrument air first passes through a drying and filtering train prior to delivery to plant instrumentation and control components and containment air lock operations.

The compressed air system also provides a backup supply of compressed gas for the main feedwater control valves and a safety-related backup air supply for the auxiliary feedwater control valves and main steam atmospheric relief valves. The backup compressed gas accumulators for the main feedwater control valves, auxiliary feedwater control valves, and main steam atmospheric relief valves are filled and pressurized with nitrogen from the service gas system. The normal source of air for operation of these components is instrument air. The compressed air system is nonsafety-related except for the safety-related backup compressed gas accumulators, containment penetration piping, and containment personnel air lock air piping. The system consists of four compressors, receivers, filters, desiccant dryers, instrumentation, piping, and valves.

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

LRA Table 2.3.3-6 identifies compressed air system component types within the scope of license renewal and subject to an AMR:

- accumulator
- closure bolting
- orifice
- piping
- tubing
- valve

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

- pressure boundary
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.6 and USAR Sections 9.3.1 and 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, the staff evaluated the system functions described in the LRA and USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 applicant responded to the staff's RAIs as discussed below.

In RAI 2.3.3.6-1 dated April 3, 2007, the staff stated that relief valve V0706 is shown on a license renewal drawing as not being within the scope of license renewal; however, is within the safety-related boundary flagging. The staff requested that the applicant explain why the relief valve is not within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that valve V0706 should be highlighted green on the license renewal boundary drawing. The applicant further stated that V0706 was evaluated as within the scope of license renewal and subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-1 acceptable because it adequately explained that the relief was already evaluated as within the scope of license renewal even though it was inadvertently excluded from the scoping boundary on its license renewal boundary drawing. Therefore, the staff's concern described in RAI 2.3.3.6-1 is resolved.

In RAI 2.3.3.6-2 dated April 3, 2007, the staff stated that some test connections attached to components within the scope of license renewal are not within the scope of license renewal as shown on a license renewal drawing. The staff requested that the applicant describe what is the license renewal intended function of the test connections attached to components within the scope of license renewal. The staff also requested that the applicant explain why it does not apply to the test connections excluded from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the test connections for valves V0683, V0684, V0685 and V0686 should be highlighted red on the license renewal boundary drawing. The applicant further stated that the test connections were evaluated as within the scope of license renewal and subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-2 acceptable because adequately explained that the test connections were already evaluated as within the scope of license renewal even though they were inadvertently excluded from the scoping boundary on their license renewal boundary drawing. Therefore, the staff's concern described in RAI 2.3.3.6-2 is resolved.

2.3.3.6.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the compressed air 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).

2.3.3.7 Chemical and Volume Control System

2.3.3.7.1 Summary of Technical Information in the Application

LRA Section 2.3.3.7 describes the chemical and volume control system (CVCS), which maintains the RCS pressure boundary, supplies water to the RCP seals, provides injection flow to the RCS for safety injection, and varies boron concentration for reactivity control. The CVCS, which provides containment isolation for penetrations P-23, P-24, and P-80, consists of the following subsystems: (1) charging, letdown, and seal water subsystem which maintains a programmed water level in the pressurizer as a proper reactor coolant inventory during all phases of plant operation, (2) the reactor coolant purification and chemistry control subsystem which maintains desired RCS water chemistry conditions for radioactivity control, (3) the reactor makeup control subsystem which provides makeup water to the RCS, and (4) the boron thermal regeneration subsystem which adjusts boron concentration when needed.

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

LRA Table 2.3.3-7 identifies CVCS component types within the scope of license renewal and subject to an AMR:

- Class 1 piping (less than or equal to 4 inches)
- closure bolting
- filter
- flexible hoses
- flow element
- heat exchanger shell side
- heat exchanger tube side
- instrument bellows
- insulation
- orifice
- piping
- pump
- sight gauge
- tank
- thermowell
- tubing
- valve

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

- flow restriction
- heat transfer
- heat loss
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs

- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.7 and USAR Section 9.3.4 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 finds that since part of the CVCS (e.g., the charging pumps) is shared with the ECCS, certain components of the CVCS are used to perform the safety-related functions required by 10 CFR 54.4(a)(1). The CVCS operates in conjunction with the refueling water, RHR and ECCS to deliver borated emergency core cooling water to the RCS following a LOCA. During the injection phase, the centrifugal charging pumps in the CVCS, along with the RHR pumps, draw suction from the RWST and inject borated water directly into the RCS.

The staff's review of LRA Section 2.3.3.7 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 2.3.3.7-1 dated May 6, 2007, the staff noted that license renewal drawing LR-WCGS-BG-M-12BG03 shows the volume control tank (TBG05) within the scope of license renewal. The staff requested that the applicant explain why the piping and spray nozzles are not included within the scope of license renewal in accordance with the requirements of 10 CFR 54.4(a)(2).

In its response dated June 1, 2007, the applicant stated that the volume control tank has an intended function of pressure boundary. As described in USAR Section 9.3.4, the volume control tank spray nozzle assembly (i.e., nozzle and pipe stub) does not have an intended function. The applicant clarified that the failure of the nozzle assemblies does not support the structural integrity of the tank nor its intended functions. The applicant further stated that the nozzle assemblies do not have an intended function for any of the license renewal regulated events and are not within the scope of license renewal based on the requirements of 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-1 acceptable because it adequately explains why the volume control tank piping and nozzles are not within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.7-1 is resolved.

In RAI 2.3.3.7-2 dated May 6, 2007, the staff noted that LRA Table 2.3.3-7 does not list component types of pumps and tanks supports. The staff requested that the applicant clarify if the pumps and tanks supports are within the scope of license renewal. If the supports are not within the scope of license renewal the staff requested that the applicant justify its response.

In its response dated June 1, 2007, the applicant stated that the CVCS supports are within the scope of license renewal and addressed as structural commodities in LRA Section 2.4.22. The applicant clarified that, depending upon the classification of the component, the pump and tank supports in the CVCS are shown in LRA Table 2.4-22 as Class 2 and 3 supports and mechanical equipment or as non-ASME supports and mechanical equipment.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-2 acceptable because it clarified that the CVCS pumps and tanks supports are within the scope of license renewal and evaluated within the structural commodity groups in LRA Section 2.4. The staff's evaluation of these commodity groups is documented in SER Section 2.4.22. Therefore, the staff's concern described in RAI 2.3.3.7-2 is resolved.

In RAI 2.3.3.7-3 dated May 6, 2007, the staff noted that license renewal drawing LR-WCGS-BG-M-12BG04 shows the spent resin storage tanks outside the scope of license renewal; however, all their connecting lines were included within the scope. The staff requested that the applicant explain this inconsistency.

In its response dated June 1, 2007, the applicant stated that the portion of the CVCS shown in drawing LR-WCGS-BG-M-12BG04 is the boron thermal regeneration system. The spent resin storage tanks referenced in the staff's RAI are the thermal regeneration demineralizers FBG02A, FBG02B, FBG02C, FBG02D, and FBG02E. The applicant clarified that the piping shown in the drawing is within the scope of license renewal due to spatial interaction in the auxiliary building. The applicant stated that each thermal regeneration demineralizer tank is located in a concrete compartment and that these compartments have no safety-related components. Therefore, the demineralizer tanks are not within the scope of license renewal as pursuant to10 CFR 54.4(a)(2).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.7-3 acceptable because it explained why the storage tanks are outside the scope of license renewal. The staff finds that the applicant adequately classified the adjacent piping within the scope of license renewal due to potential spatial interaction. Therefore, the staff's concern described in RAI 2.3.3.7-3 is resolved.

2.3.3.7.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CVCS 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).

2.3.3.8 Auxiliary Building HVAC System

2.3.3.8.1 Summary of Technical Information in the Application

LRA Section 2.3.3.8 describes the auxiliary building HVAC system, which must maintain a suitable environment for safety-related equipment under normal conditions and during DBEs. Portions of the auxiliary building HVAC system are isolated upon a safety injection signal. The portion of the auxiliary building/fuel building normal exhaust subsystem serving the fuel building is isolated automatically and the exhaust fan flow maintained in a radioactive release from a fuel-handling event. Individual pump room coolers maintain a suitable ambient environment for the safety-related pump electric motor drivers. The penetration room coolers maintain a suitable atmosphere for the safety-related electrical equipment in the electrical penetration rooms. The auxiliary building HVAC system consists of the following four subsystems:

- auxiliary building supply subsystem
- auxiliary building/fuel building normal exhaust subsystem
- emergency exhaust subsystem
- access tunnel transfer fan

The auxiliary building supply subsystem provides conditioned outside air to the auxiliary building for ventilation and for cooling of safety-related equipment rooms in each building level. The auxiliary building supply subsystem is isolated upon a safety injection signal. The auxiliary and fuel buildings share the auxiliary building/fuel building normal exhaust subsystem that exhausts clean air to the environment. This subsystem also exhausts decontamination tank scrubber air to the environment. The auxiliary building/fuel building normal exhaust subsystem is isolated upon a safety injection signal or in the event of a radioactive release from a fuel-handling accident in the fuel building. The emergency exhaust subsystem collects and processes airborne particulates in the auxiliary building/fuel building. This subsystem also exhausts air purged from the containment via the containment hydrogen control system. Air is exhausted to the vent stack. The access tunnel transfer fan transfers air from the auxiliary building to the radwaste tunnel. This subsystem is split between the auxiliary building HVAC system and the miscellaneous building HVAC system.

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

LRA Table 2.3.3-8 identifies auxiliary building HVAC system component types within the scope of license renewal and subject to an AMR:

- closure building
- damper
- ductwork
- fan
- flex connector
- heat exchanger shell side

- heat exchanger tube side
- piping
- pump
- tank
- tubing
- valve

The intended functions of the auxiliary building HVAC system component types within the scope of license renewal include:

- rated fire barrier to confine or retard a fire from spreading
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.8 and USAR Sections 9.4.2 and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.8 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 2.3.3.8-1 dated April 18, 2007, the staff requested that the applicant clarify if the damper housings, heating coil housings, pump casing, valve bodies, and fan housings in the auxiliary building HVAC system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawings LR-WCGS-GL-M-12GL01, LR-WCGS-GL-M-12GL02, and LR-WCGS-GL-M-12GL03 are included in the component types listed in LRA Table 2.3.3-8. The applicant clarified that the pump casings, valve bodies, fan housings, and damper housings are included within the category or commodity groups of pump, valve, fan, and damper, respectively. The applicant also stated that the auxiliary building HVAC system heaters are provided by the plant heating system through heat exchangers. They are included within the scope of license renewal and are listed in LRA Table 2.3.3-8 as component types of heat exchanger shell side and heat exchanger tube side. The applicant clarified that there are no heater housings involved in this system that are subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.8-1 acceptable because it clarified that the pump casings, valve bodies, fan housings, damper housings and the shell and tube side of the heat exchangers are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.8-1 is resolved.

2.3.3.8.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the auxiliary building HVAC 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).

2.3.3.9 Control Building HVAC System

2.3.3.9.1 Summary of Technical Information in the Application

LRA Section 2.3.3.9 describes the control building HVAC system, which has several safety-related subsystems required to function following DBEs to achieve and maintain the plant in a safe shutdown condition. These subsystems must maintain a suitable environment for the control room and for Class 1E electrical equipment under normal conditions and during DBEs. The control building HVAC system also isolates nonsafety-related portions of the HVAC system on a control room ventilation isolation signal so that habitability of the control room is not compromised. The control building HVAC system consists of seven subsystems:

- control building supply subsystem
- control building exhaust subsystem
- access control exhaust subsystem
- control room air conditioning subsystem
- Class 1E electrical equipment air conditioning subsystem
- secondary alarm station room air conditioning subsystem
- counting room recirculation subsystem

The control building supply subsystem supplies outside conditioned air to the control building under normal conditions and is isolated in accident conditions. The control building exhaust subsystem exhausts air from clean areas of the control building under normal conditions and is isolated in accident conditions. The access control exhaust subsystem exhausts air from potentially contaminated portions of control building. Air is filtered and then exhausted through the unit vent. This subsystem is isolated in accident conditions. The control room air conditioning subsystem maintains a suitable environment for personnel and equipment during normal and accident conditions. The Class 1E electrical equipment air conditioning subsystem maintains a suitable environment for Class 1E electrical equipment during normal and accident conditions. The secondary alarm station room air conditioning subsystem provides a suitable environment for the secondary alarm station during normal conditions. The counting room recirculation subsystem provides a suitable environment for the counting room personnel and equipment during normal conditions.

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

LRA Table 2.3.3-9 identifies control building HVAC system component types within the scope of license renewal and subject to an AMR:

- adsorber
- closure bolting
- compressor
- damper
- ductwork
- fan
- flex connectors
- heat exchanger shell side
- heat exchanger tube side
- piping
- pump
- tubing
- valve

The intended functions of the control building HVAC system component types within the scope of license renewal include:

- rated fire barrier to confine or retard a fire from spreading
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs

2.3.3.9.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.9 and USAR Sections 6.4, 6.5.1, 7.3.4, 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.9 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 2.3.3.9-1 dated April 18, 2007, that staff requested that the applicant clarify if the housings for filter adsorption units, compressor housings, fire dampers, damper housings including fire damper housings, heating coil housings, pump casings, valve bodies, and pressure boundary sealants in the control building HVAC system are within the scope of license renewal.

In its response May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawings LR-WCGS-GK-M-12GK01, LR-WCGS-GK-M-12GK02, LRWCGS-GK-M-12GK03, and LR-WCGS-GK-M-12GK04 are included in the component types listed in LRA Table 2.3.3-9. The applicant clarified that pump casings, valve bodies, fan housings, damper housings, and filter adsorber housings are included within the scope of license renewal under the categories or commodity groups of pumps, valves, fan, damper, and adsorber, respectively.

The applicant also stated that the compressor housings are within the scope of license renewal and addressed as component type of compressor. Also, the heaters of the control building HVAC system are provided by the plant heating system through heat exchangers. They are included within the scope of license renewal and listed in LRA Table 2.3.3-9 as component types of heat exchanger shell side and heat exchanger tube side. However, there are no heater housings involved in this system that are subject to an AMR.

The applicant clarified that the fire barrier seals and structural pressure boundary sealant are evaluated within the structures scoping and screening results in LRA Table 2.4-2. Also, the air intake louvers are addressed as generic structural steel in LRA Table 2.4-2.

The applicant also clarified that the mechanical boundaries in the HVAC system terminate where the duct meets the interior wall. Entry and exit plenums shown on the drawings are those plenums that penetrate the building walls to the outside. The concrete associated with these plenums is included within the scope of license renewal as a generic concrete component in LRA Table 2.4-2.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.9-1 acceptable because it clarified that the pump casings, valve bodies, fan housings, damper housings, filter adsorber housings, compressor housings, shell and tube side heat exchangers, and air intake louvers are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.9-1 is resolved.

2.3.3.9.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the control building HVAC 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).

2.3.3.10 Fuel Building HVAC System

2.3.3.10.1 Summary of Technical Information in the Application

LRA Section 2.3.3.10 describes the fuel building HVAC system, which isolates the fuel building normal ventilation system upon a high radiation or LOCA signal and processes air via the emergency exhaust system to maintain the fuel building at a negative pressure. The fuel building HVAC system spent fuel pool cooling pump room coolers maintain a suitable ambient temperature for the spent fuel cooling pump motors. The fuel building HVAC system provides fresh air, heated or cooled as required, for the fuel building; isolates the fuel building upon receipt of a high-radiation or LOCA signal; and processes airborne particulate in the fuel building when required. The fuel building HVAC system consists of the emergency exhaust system, the fuel storage pool cooling pump room coolers, and fuel building HVAC normal supply system fans and ducting.

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

LRA Table 2.3.3-10 identifies fuel building HVAC system component types within the scope of license renewal and subject to an AMR:

- adsorber
- closure bolting
- damper
- ductwork
- fan
- flex connectors
- heat exchanger shell side
- heat exchanger tube side
- heater
- piping
- pump
- tubing
- valve

The intended functions of the fuel building HVAC system component types within the scope of license renewal include:

- rated fire barrier to confine or retard a fire from spreading
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs

2.3.3.10.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.10 and USAR Sections 7.3.3 and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.10 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 2.3.3.10-1 dated April 18, 2007, the staff requested that the applicant clarify if the housings for filter adsorber units, damper housings, fire dampers and associated housings, heating coil housings, pump casings, valve bodies, pressure boundary sealants, and fan housings in the fuel building HVAC system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawings LR-WCGS-GG-M-12GG01, and LR-WCGS-GG-M-12GG02 are included in the component types listed in LRA Table 2.3.3-10. The applicant clarified that the pump casings, valve bodies, fan housings, damper housings, and filter adsorber housings are included within the scope of license renewal within the categories or commodity groups of pump, valve, fan, damper, and adsorber, respectively.

The applicant stated that heaters in the fuel handling HVAC system are mounted on the ductwork or provided by the plant heating system through in-line heat exchangers. The portion of the duct-mounted heaters that has an intended function of maintaining ductwork pressure boundary are included within the scope of license renewal in LRA Table 2.3.3-10 as a component type of heater. The portion of the in-line heaters that has an intended function of maintaining ductwork pressure boundary are included as component types of heat exchanger shell side and heat exchanger tube side.

The applicant clarified that fire barrier seals, structural pressure boundary sealants, miscellaneous caulking, and sealants in the fuel building are evaluated within the structures scoping and screening results in LRA Table 2.4-12. Also, air intake louvers have been included within the scope of license renewal as generic structural steel in LRA Table 2.4-12.

The applicant also stated that mechanical boundaries in the HVAC system terminate where the duct meets the interior wall. Entry and exit plenums shown on the drawings are those plenums that penetrate the building walls to the outside. The concrete associated with these plenums is included within the scope of license renewal as a generic concrete component in LRA Table 2.4-12.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.10-1 acceptable because it clarified that the pump casings, valve bodies, fan housings, damper housings, filter adsorber housings, shell and tube side heat exchangers, fire barrier seals, and miscellaneous caulking are included within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.10-1 is resolved.

2.3.3.10.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the fuel building HVAC 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).

2.3.3.11 Essential Service Water Pumphouse Building HVAC System

2.3.3.11.1 Summary of Technical Information in the Application

LRA Section 2.3.3.11 describes the ESW pumphouse building HVAC system, which maintains an environment suitable for operation of the ESW pump motors and electrical equipment. The ESW pumphouse building HVAC system, excluding the unit heaters, is safety-related and must function following DBEs. The ESW pumphouse building HVAC system cools the ESW pump motors, using outside air as the cooling medium. Air is supplied to and vented from the building through exhaust louvers. Each ESW pumproom has a separate system. Electric unit heaters provide heating during winter months.

The ESW pumphouse building HVAC system has safety-related components relied upon to remain functional during and following DBEs. In addition, the ESW pumphouse building HVAC system performs functions that support fire protection.

LRA Table 2.3.3-11 identifies ESW pumphouse building HVAC system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper
- ductwork
- fan
- flex connector

The intended function of the ESW pumphouse building HVAC system component types within the scope of license renewal is to provide a pressure boundary.

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.11 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.11 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 2.3.3.11-1 dated April 18, 2007, the staff requested that the applicant clarify if the damper housings, intake and exhaust louvers with their associated housings and plenums, and fan housings in the ESW pumphouse building HVAC system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-GD-M-K2GD01 are included in the component types listed in LRA Table 2.3.3-11. The applicant clarified that the fan housings, damper housings, including fire damper housings, are included within the scope of license renewal within the categories or commodity groups of fan and damper, respectively.

The applicant clarified that air intake louvers have been included within the scope of license renewal as generic structural steel in LRA Table 2.4-13. Also, mechanical boundaries in the HVAC system terminate where the duct meets the interior wall. Entry and exit plenums shown on the drawings are those plenums that penetrate the building walls to the outside. The concrete associated with these plenums is included within the scope of license renewal as a generic concrete component in LRA Table 2.4-13.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.11-1 acceptable, because it clarified that the damper housings, intake and exhaust louvers with their associated housings and plenums, and fan housings are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.11-1 is resolved.

2.3.3.11.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESW pumphouse building HVAC 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).

2.3.3.12 Miscellaneous Buildings HVAC System

2.3.3.12.1 Summary of Technical Information in the Application

LRA Section 2.3.3.12 describes the miscellaneous buildings HVAC system, which is relied upon to isolate the miscellaneous buildings HVAC system from the auxiliary building ventilation system upon a safety injection signal. In addition, the auxiliary feedwater pump room coolers must maintain a suitable environment for safety-related equipment in the auxiliary feedwater pump rooms under normal conditions and DBEs.

The miscellaneous buildings HVAC system consists of the following subsystems:

- tendon access gallery supply and exhaust subsystem
- main steam enclosure building supply and exhaust subsystem
- auxiliary feedwater pump room coolers
- access tunnel supply and exhaust subsystem
- auxiliary boiler room supply and exhaust subsystem
- RWST valve house
- reactor makeup water storage tank valve house
- condensate and demineralized water pipe tunnel

The tendon access gallery supply and exhaust subsystem utilizes conditioned air from the auxiliary building for ventilation, heating, and cooling during periods of personnel access. The main steam enclosure building supply and exhaust subsystem provides outside air for ventilation, heating, and cooling of the main steam enclosure building and exhausts air through the unit vent stack. The auxiliary feedwater pump room coolers maintain a suitable environment for safety-related equipment in the auxiliary feedwater pump rooms. The access tunnel supply and exhaust subsystem maintains a suitable environment for personnel and equipment within the access tunnel. The auxiliary boiler room supply and exhaust subsystem maintains a suitable environment for personnel and equipment within the auxiliary boiler room. The RWST valve house unit heaters, the reactor makeup water storage tank valve house unit heaters, and the condensate and demineralized water pipe tunnel unit heaters provide heating in respective areas.

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

LRA Table 2.3.3-12 identifies miscellaneous buildings HVAC system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper
- ductwork
- fan
- flex connector
- heat exchanger shell side
- heat exchanger tube side
- piping
- pump
- tubing
- valve

The intended functions of the miscellaneous buildings HVAC system component types within the scope of license renewal include:

- rated fire barrier to confine or retard a fire from spreading
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs

2.3.3.12.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.12 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.11 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 2.3.3.12-1 dated April 18, 2007, the staff requested that the applicant clarify if the damper housings, heating coil housings, pump casings, valve bodies, and fan housings in the miscellaneous building HVAC system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-GF-M-12GF01 are included in the component types listed in LRA Table 2.3.3-12. The applicant clarified that the pump casings, valve bodies, fan housings, damper housings, including fire damper housings, are included within the scope of license renewal in the categories or commodity groups of pump, valve, fan, and damper, respectively.

The applicant stated that the heaters in the miscellaneous buildings HVAC system are provided by the plant heating system through heat exchangers. They are included within the scope of license renewal in LRA Table 2.3.3-12 as component types of heat exchanger shell side and heat exchanger tube side. The applicant clarified that there are no heater housings involved in this system that are subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.12-1 acceptable because it clarified that the damper housings, pump casings, valve bodies, fan housings, and shell and tube side heat exchangers are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.12-1 is resolved.

2.3.3.12.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the miscellaneous buildings HVAC 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).

2.3.3.13 Diesel Generator Building HVAC System

2.3.3.13.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13 describes the diesel generator building HVAC system, which provides combustion air and maintains an environment suitable for the operation of the diesel generators. The diesel generator building HVAC system, excluding the unit heaters, is safety-related and must function following DBEs. The diesel generator building HVAC system provides combustion air and cooling for the diesel generators, using outside air as the cooling medium. Outside air is supplied to the building, circulated, and returned outside through exhaust louvers. Each diesel generator room has a separate cooling system and an electric unit heater for heating.

The diesel generator building HVAC system has safety-related components relied upon to remain functional during and following DBEs. In addition, the diesel generator building HVAC system performs functions that support fire protection.

LRA Table 2.3.3-13 identifies diesel generator building HVAC system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper

- ductwork
- fan
- flex connector

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

2.3.3.13.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.13 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.13 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 2.3.3.13-1 dated April 18, 2007, the staff requested that the applicant clarify if the damper housings, fan housings, valve bodies, intake and exhaust louvers and associated housings and plenums in the diesel generator building HVAC system are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawing LR-WCGS-GM-M-12GMOI are included in the component types listed in LRA Table 2.3.3-13. The applicant clarified that the fan housings and damper housings are included within the scope of license renewal in the categories or commodity groups of fan and damper, respectively.

The applicant stated that air intake louvers have been included within the scope of license renewal as generic structural steel in LRA Table 2.4-3. Also, mechanical boundaries in the HVAC system terminate where the duct meets the interior wall. Entry and exit plenums shown on the drawings are those plenums that penetrate the building walls to the outside. The concrete associated with these plenums is within the scope of license renewal as a generic concrete component in LRA Table 2.4-3. The applicant clarified that there are no valves involved in this system.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.13-1 acceptable because it clarified that the damper housings, intake and exhaust louvers and associated housings and plenums, and fan housings are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.13-1 is resolved.

2.3.3.13.3 Conclusion

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

2.3.3.14 Fire Protection System

2.3.3.14.1 Summary of Technical Information in the Application

LRA Section 2.3.3.14 describes the fire protection system.

The fire protection system minimizes the effects of fire on plant SSCs. The failure of nonsafety-related fire protection systems could potentially prevent the satisfactory accomplishment of a safety-related function of SSCs.

The fire protection system consists of four subsystems: (1) the fire water pumps, fire water pump drivers, and underground distribution system including outside loop, hydrants, sectional control valves, and isolation valves, (2) hose stations, standpipes, Halon, deluge, and pre-action systems within the power block, including control valves, spray nozzles, and sprinkler heads, (3) diesel fuel oil supply to the 100-percent capacity engine-driven fire pump, and (4) water supply to the jockey pump from the plant service water system.

The fire protection system includes components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with NRC regulation.

LRA Table 2.3.3-14 identifies fire protection system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- filter
- flexible hoses
- hose station
- piping
- pump
- spray nozzle
- sprinkler head
- strainer
- tank
- tubing
- valve (including fire hydrant)

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

- filtration
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- converts fluid into spray

2.3.3.14.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14, USAR Section 9.5.1, "Fire Protection System," and the NRC supplemental SER dated March 1985, approving the WCGS fire protection program described in the WCGS Operating License Condition 2C(5)(a), using the evaluation methodology described in SER Section 2.3, "Scoping and Screening Results: Mechanical Systems," and the guidance in SRP-LR Section 2.3.

The staff also reviewed WCGS commitments to 10 CFR 50.48, using the Branch Technical Position (BTP) Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," May 1, 1976, and Appendix A to BTP APCSB 9.5-1, August 23, 1976, documented in USAR Tables 9.5A-1 and 9.5E-1. The staff also reviewed the "TR 3, Fire Protection License Renewal Position Paper," Revision 1, dated August 2, 2006, that describes the WCGS fire protection regulatory requirements.

During its review, the staff evaluated the system functions described in the LRA and USAR to verify that the applicant had not omitted from the scope of license renewal any components with intended functions delineated pursuant to 10 CFR 54.4(a). The staff then reviewed those components that the applicant had identified as being within the scope of license renewal to verify that the applicant had not omitted any passive or long-lived components that should be subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.14 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 2.3.3.14-1 dated April 3, 2007, the staff stated that the seven LRA drawings listed below show fire protection system components not highlighted in green indicating that they are outside the scope of license renewal. The staff requested that the applicant verify whether these components are within 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 not, the staff requested that the applicant provides a justification for their exclusion.

(1) LR-WCGS-KC-M-0022-1, "Plant Service Water System," shows the following components outside the scope of license renewal:

    - one of the four vertical pumps (1WS002P) and its associated components
    - several flow drains (1W30102, 1W30103, etc.)

(2) LR-WCGS-KC-M-0023-1, "Fire Protection Water System," shows the following components outside the scope of license renewal:

- fire hydrant (1FP0138) and its associated components
- several flow drains

(3) LR-WCGS-KC-M-0023-2, "Fire Protection System," shows the following components outside the scope of license renewal:

- several valves

(4) LR-WCGS-KC-M-0028, "Diesel Oil System," shows the following components outside the scope of license renewal:

- flame arrester vent line
- fill cap assembly

(5) LR-WCGS-KC-M-12KCO1, "Fire Protection Turbine Building," shows the following components outside the scope of license renewal:

- several line valves
- several sprinkler heads

(6) LR-WCGS-KC-M-12KCO2, "Fire Protection System," shows the following components outside the scope of license renewal:

- several flow drains (reactor building, communications corridor, and auxiliary feedwater pipe chase area)
- valves V0281 and V04323 (communications corridor)
- sprinkler system (auxiliary boiler room)
- drain valve V0859 (auxiliary feedwater pipe chase area)
- several drains and valves (reactor building)
- lines and two valves (generator rooms A and B)

(7) LR-WCGS-KC-M-12KCO3, "Fire Protection System," shows the following components outside the scope of license renewal:

- several drain valves

In its response dated May 3, 2007, the applicant stated that the portions of the fire protection system that do not support WCGS post-fire safe-shutdown requirements or are not identified in the WCGS response to APCSB 9.5-1, Appendix A, in USAR Table 9.5A-1 are identified as having no license renewal intended functions based on the fire protection criteria described in 10 CFR 54.4(a)(3). The applicant indicated that interactions of fire protection system components with safety-related equipment were also evaluated to determine if the components have a license renewal intended function and should be added to the scope of license renewal. The applicant provided the following responses:

(1) LR-WCGS-KC-M-0022-1, "Plant Service Water System"

- vertical pump. Pump 1WS002P is a low flow, low capacity pump called the low flow and startup pump. The low flow and startup pump is used during startup conditions or low flow conditions to maintain the service water system header at a minimum pressure to prevent service water pump run out as described in USAR Section 9.2.1.1.2.3. The low flow and startup pump has no license renewal intended function.

- several flow drains. There is no safety-related equipment in the circulating water screenhouse that can be affected by fluid-filled piping spatial interaction of the flow drains. The flow drains do not have a license renewal intended function.

(2) LR-WCGS-KC-M-0023-1, "Fire Protection Water System"

- fire hydrant. Fire Hydrant 1FP0138 and its associated components located outside the circulating water screenhouse do not have a license renewal intended function.

- several flow drains. There are no safety-related equipment in the circulating water screenhouse that can be affected by fluid-filled piping spatial interaction of the flow drains. The flow drains do not have a license renewal intended function.

(3) LR-WCGS-KC-M-0023-2, "Fire Protection System"

- several valves. These valves supply water to portions of the fire water suppression system (e.g., security building, shop building, etc.) that do not support WCGS post-fire safe-shutdown requirements nor are they identified in the WCGS response to APCSB 9.5-1, Appendix A, in USAR Table 9.5A-1. The valves do not have a license renewal intended function.

(4) LR-WCGS-KC-M-0028, "Diesel Oil System"

- flame arrestor vent line and fill cap assembly. Flame arrestors vent line 1DO008A-2, diesel fire pump engine oil-return flame arrestor vent line 1DO0016A-1/2, and fill cap line 1DO007A-3 will be added to the scope of license renewal. LRA Tables 2.3.3-14 and 3.3.3-14 will be revised to include these new components.

(5) LR-WCGS-KC-M-12KCO1, "Fire Protection Turbine Building"

- several line valves and sprinkler heads. The response to RAI 2.3.3.14-5 describes the portions of the fire suppression system that are excluded from the scope of license renewal and the justification for the exclusion.

(6) LR-WCGS-KC-M-12KCO2, "Fire Protection System"

- communication corridor. These vent and drain valves are located in the communications corridor. There is no safety-related equipment in the communications corridor that can be affected by fluid-filled piping spatial interaction. The components within the scope of license renewal in the communications corridor are only those components with a fire protection intended function. The communication corridor components that are within the scope of license renewal are piping and piping components associated with fire hose reels and fire hose connections. Valves V0281 and V0423 do not have a license renewal intended function.

- auxiliary boiler room. The response to RAI 2.3.3.14-5 describes portions of the fire suppression system that are excluded from the scope of license renewal.

- auxiliary feedwater pipe chase. Drain valve V0859 does not have a license renewal intended function. There is no safety-related equipment outside of the auxiliary feedwater pipe chase area (in the vicinity of V0859) that can be affected by fluid-filled piping spatial interaction. The only components within the scope of license renewal that are outside of the auxiliary feedwater pipe chase area are fire protection components.

- reactor building. The hose stations and sprinkler systems in the reactor building are isolated and drained during normal plant operation. Failure of the vent and drain valves would not affect safety-related equipment through spatial interaction. The components within the scope of license renewal in the reactor building are only those components with a fire protection intended function. The vent and drain components in the reactor building do not have a license renewal intended function.

- diesel generator rooms. The lines and valves are part of the service air system. There is no potential for spatial interaction with this air-filled piping. The service air system is evaluated in LRA Section 2.3.3.6.

(7) LR-WCGS-KC-M-12KCO3, "Fire Protection System"

- several drain lines. These vent and drain valves are located in the radwaste building. There is no safety-related equipment in the radwaste building that can be affected by fluid-filled piping spatial interaction. The components within the scope of license renewal in the radwaste building are only those components with a fire protection intended function. The radwaste building components that are within the scope of license renewal are piping and piping components associated with fire hose reels, sprinklers and fire hose connections. Vent, drain valves and piping in the radwaste building do not have a license renewal intended function.

Based on its review, the staff did not agree with the justification for excluding portions of fire protection systems and components on the bases that these fire suppression systems and components are not required for achieving a safe shutdown in the event of a fire. The staff found that the applicant's analysis of fire protection regulations does not completely capture the fire protection SSCs required for compliance with 10 CFR 50.48. The scope of SSCs required for compliance with 10 CFR 50.48 (and associated 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 3) goes beyond preserving the ability to maintain safe shutdown in the event of a fire. GDC 3 states in part, that "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." Furthermore, the general requirements provided in GDC 3 to "minimize the adverse effects of fires on SSC's important to safety" are stated to provide a general level of protection which is afforded to all systems, not only where required to prevent a loss of safe-shutdown capability. Section 50.48(a) of 10 CFR states that, "each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A of this part." The term "important to safety" encompasses a broader scope of equipment than safety-related and safe shutdown equipment. Though there is a focus on the protection of safety-related equipment or safe shutdown equipment, this does not imply that there is an exclusion of any equipment which protects nonsafety-related equipment. For example, in accordance with 10 CFR 50.48, some portions of suppression systems may be required in plant areas where a fire could result in the release of radioactive materials to the environment, even if no safety-related or safe shutdown equipment is located in that particular fire area.

Subsequently, the staff reviewed commitments made by the applicant to satisfy to BTP APCSB 9.5-1, Appendix A. The staff found that pump 1WS002P, fire hydrant 1FP0138, the flow drains in circulating water screenhouse, and the valves in security and shop buildings have no intended functions associated with 10 CFR 54.4(a)(2), and that these systems and components were correctly excluded from the scope of license renewal and not subject to an AMR. In addition, by letter dated August 31, 2007, the applicant added the flame arrestor vent line and fill cap assembly within the scope of license renewal. Therefore, they are subject to an AMR. As discussed in the RAI response, the flame arrestors were added to LRA Tables 2.3.3-14 and 3.3.3-14. The staff finds that these components will be adequately managed during the period of extended operation. Therefore, the staff's concern described in RAI 2.3.3.14-1 is resolved.

In RAI 2.3.3.14-2 dated April 3, 2007, the staff noted that the NUREG-0881, Supplement 5, Section 9.5.1.1, states that the fire pumps take suction from a common wet pit sump in the circulating water screenhouse. Two traveling water screens and the bar grill are located at the inlet to the sump serving the fire pumps. LRA Section 2.3.3.14 and Table 2.3.3.14 do not clearly state whether the traveling water screens and bar grill are included within the scope of license renewal. The staff requested that the applicant verify whether the traveling water screens and bar grill and their associated components are within 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 not, the staff requested that the applicant provides a justification for their exclusion.

In its response dated May 2, 2007, the applicant stated that the traveling screens and bar grill are part of service water system. The service water system is not required for safe shutdown of the plant. Traveling screens remove debris from the circulating and service water system flow path to prevent plugging of the condenser water box inlets and loss of service water flow.

The applicant stated that during emergency operations, the circulating water pumps are unnecessary and, in fact, may be unavailable due to a loss of offsite power. For normal and emergency operations without the circulating water pumps operating, a much lower volume of water flows through the traveling screens. The lower flow rates make it unlikely that debris could clog the traveling screens and prevent them from passing adequate flow. An open pipe connecting to the adjacent sump in the circulating water screenhouse is provided as a second source of water to the pumps. There are four 12-inch diameter pipe connections between the fire pump screenhouse sump and the adjacent circulating water screenhouse sump. In the event of blockage of water through the traveling screens in the fire pump sump, one connection between bays and one operational traveling screen is all that is required to provide adequate fire water.

The applicant also stated that the traveling screens perform their function with moving parts and can be rotated and backwashed, manually or automatically, due to differential pressure across the screens. These components are considered active. Therefore, the applicant concluded that the traveling screens and bar grill are not within the scope of 10 CFR 54.4(a) and are not subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-2 acceptable because it adequately described that the intended function supporting the fire pump suction supply is accomplished by the redundant traveling screen and bar grill. If a blockage were to occur, one connection out of four 12-inch diameter pipes provides adequate fire water to bypass the blockage and continue to supply water to the pump suctions. Additionally, the fire pump suction headers have their own strainers in-line, such that the loss of the trash racks or traveling screens would not challenge the operation of these pumps until repair or replacement of the damaged component could be performed. Therefore, the staff's concern described in RAI 2.3.3.14-2 is resolved.

In RAI 2.3.3.14-3 dated April 3, 2007, the staff noted that NUREG-0881, Supplement 5, Section 9.5.1.2, states that where safe shutdown equipment is enclosed by a fire barrier, all walls, ceilings, floors, and associated penetrations that enclose the equipment have a minimum fire rating of three hours. LRA Section 2.3.3.14 and Table 2.3.3.14 do not clearly state whether fire barrier walls, ceilings, floor, slabs, and associated penetration seals are included within the scope of license renewal. The staff requested that the applicant verify whether these fire barrier walls, ceilings, floor, slabs, and associated penetration seals are within 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 not, the staff requested that the applicant provides a justification for their exclusion.

In its response dated May 3, 2007, the applicant stated that as noted in LRA Section 2.3.3.14, "Other passive fire barriers are screened as part of the structure." Each structure within the scope of license renewal is discussed separately in LRA Section 2.4. Those structures that are required to support fire protection include a statement to that effect in the structure function discussion. The component-function relationship tables in LRA Section 2.4 show fire barriers as one of the intended functions for the component types that are credited as part of the fire protection system. For example, LRA Table 2.4.2, lists the fire barrier function for component types concrete block (masonry walls), concrete elements, fire barrier coatings and wraps, fire barrier doors, and fire barrier seals. Therefore, fire barrier elements are within the scope of license renewal and subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-3 acceptable because the structural fire barriers in question were identified to be within the scope of license renewal and subject to an AMR. The applicant stated that the structural fire barriers (i.e., walls, ceilings, and floors) are discussed separately in LRA Section 2.4, and that LRA Table 2.4.2 lists fire barrier functions for these component types. Therefore, the staff's concern described in RAI 2.3.3.14-3 is resolved.

In RAI 2.3.3.14-4 dated April 3, 2007, the staff stated that LRA Table 2.3.3-14 excludes several types of fire protection components that are listed in NUREG-0881, Supplement 5, and/or the WCGS USAR. In addition, the LRA drawings highlighted them in green as components within the scope of license renewal. The staff requested that the applicant verify whether the components listed below should be included in LRA Table 2.3.3.14. If they are excluded from the scope of license renewal and not subject to an AMR, the staff requested that the applicant provides a justification for the exclusion.

- hose connections
- hose racks
- pipe fittings
- pipe supports
- couplings
- threaded connections
- restricting orifices
- interface flanges
- chamber housings
- heat-actuated devices
- gauge snubbers
- tank heaters
- Halon 1301 storage cylinders
- thermowells
- water motor alarms
- expansion joint
- filter housing
- gear box housing
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tube)
- heater housing
- engine muffler (diesel driven fire pump)
- engine intake and exhaust silencers (diesel driven fire pump)
- orifice
- sight glass
- strainer housing
- turbocharger housing
- flexible hose
- latch door pull box
- pneumatic actuators
- actuator housing
- dikes
- storage tanks (fire water system)

- buried underground fuel oil tanks
- expansion tank
- jacket cooling water keepwarm pump and heater
- lubricating oil collection system components (reactor coolant pumps)
- lubricating oil cooler
- auxiliary lubricating oil makeup tank
- rocker lubricating oil pump
- water floor drains
- flame retardant coating for cables
- fire barrier penetration seals
- fire barrier walls, ceilings, floor, and slabs
- fire doors
- fire rated enclosures
- fire retardant coating for structural steel supporting wall and ceiling

In its response dated May 3, 2007, the applicant stated that the fire protection system includes components from the fire protection system (power block), the fire protection system (non-power block), the diesel oil system and the service water system. The applicant stated the following:

- Hose connections. Hose connections are included in the valve line item in LRA Table 2.3.3-14.

- Hose racks. Hose racks are included in the hose station line item in LRA Table 2.3.3-14.

- Pipe fittings. The component type of piping used in LRA Table 2.3.3-14 includes piping fittings. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B.

- Pipe supports. Pipe supports were evaluated as a structural commodity group. Fire protection pipe supports are included as supports, mechanical equipment non-ASME component type on LRA Table 2.4-22.

- Coupling. The component type of piping used in LRA Table 2.3.3-14 includes couplings. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B.

- Threaded connections. The component type of piping used in LRA Table 2.3.3-14 includes threaded connections. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B.

- Restricting orifices. Restricting orifices with unique component numbers are identified as a component type of orifice. There are no orifices in the fire protection system with unique component identification numbers.

- Interface flanges. The component type of piping used in LRA Table 2.3.3-14 includes interfacing flanges. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B.

- Chamber housing. The component type of piping used in LRA Table 2.3.3-14 includes chamber housing. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B. The only component in the fire protection component list specifically identified as a chamber is the foam maker chamber housing. The foam maker chamber housing is part of the foam suppression system for the fuel oil storage tank. The foam fire suppression system is a manually operated foam extinguishing system located in the fuel oil pumphouse. The fuel oil pumphouse is protected to satisfy Nuclear Electric Insurance Limited property protection requirements, has no intended function and is not within the scope of license renewal.

- Heat actuated devices. Heat actuated devices are active electrical components within the scope of license renewal but not subject to an AMR. Electrical component evaluations are described in LRA Section 2.5.

- Gauge snubbers. Gauge snubbers are integral parts of tubing runs that protect instrumentation from pressure surges. Gauge snubbers in tubing runs to instruments are included as a component type of tubing in LRA Table 2.3.3-14.

- Tank heaters. Tank heaters are active electrical components within the scope of license renewal but not subject to an AMR. Electrical component evaluations are described in LRA Section 2.5. Tank heater housings are subject to an AMR if they serve a pressure boundary function. There are no tank heaters with a pressure boundary function in the fire protection system.

- Halon 1301 storage cylinders. The component type of tank used in LRA Table 2.3.3-14 includes Halon 1301 storage cylinders. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B.

- Thermowells. The component type of piping used in LRA Table 2.3.3-14 includes thermowells. This is consistent with the definition of piping, piping components, and piping elements noted in the GALL Report, Chapter IX.B.

- Water motor alarms. Water motor alarms are water flow alarms used to provide positive indication of fire water system operation. Water motor alarms are active electrical components within the scope of license renewal but not subject to an AMR. Electrical component evaluations are described in LRA Section 2.5.

- Expansion joints. Expansion joints with unique component numbers are identified as a component type of expansion joint. There are no expansion joints in the fire protection system with unique component identification numbers.

- Filter housing. Filter housings within the scope of licence renewal in the fire protection system are evaluated as part of the component type of filter in LRA Table 2.3.3-14 and include intended functions for both pressure boundary and filter.

- Gear box housing. Gear boxes associated with the fire protection system do not have unique component identification numbers. Gear boxes that may be part of a large skid assembly (e.g., fire pump diesel) are evaluated as part of that larger component.

- Heat exchanger. The diesel driven fire pump engine has an integral oil cooler. The oil cooler is integral to the diesel engine and is evaluated as part of the engine. The diesel engine is an active component and not subject to an AMR.

- Heater housings. Heater housings are subject to review if they serve a pressure boundary function. There are no heater housings in the fire protection system.

- Engine muffler (diesel driven fire pump). The diesel driven fire pump engine muffler will be added to the scope of license renewal as a component type of piping in LRA Table 2.3.3-14.

- Engine intake and exhaust silencers (diesel driven fire pump). Intake and exhaust silencers associated with the fire protection system do not have unique component identification numbers. The fire pump diesel engine is an active component and not subject to an AMR. The diesel engine air intake is integral to the engine and evaluated as part of the engine. The diesel fire pump engine exhaust has unique component numbers (further discussed in engine muffler response above).

- Orifice. Orifices with unique component numbers are identified as a component type of orifice. There are no orifices in the fire protection system with unique component identification numbers.

- Sight glass. Sight glasses are included in the component type of sight gauge. Sight gauge 1LIDO001 diesel oil day tank level indicator was inadvertently scoped as an electrical instrument. The sight gauge will be removed from the electrical system and included within the scope of license renewal as a mechanical component in the diesel oil and fire protection (power block) systems. The component type sight gauge will be added to LRA Tables 2.3.3-14 and 3.3.2-14.

- Strainer housing. Strainer housings within the scope of license renewal in the fire protection system are evaluated as component type Strainer.

- Turbocharger housing. The diesel driven fire pump is not turbocharged.

- Flexible hose. Flexible hoses within the scope of license renewal in the fire protection system are listed as a generic component type of flexible hoses.

- Latch door pull box. The latch door pull box on a carbon dioxide and Halon system is used to provide mechanical operation of the stop/selector valve and/or the local lever actuator from a remote location. The latch door pull box has a door that must be opened in order to access the pull handle. The latch door pull box is within the scope of license renewal but is an active component and not subject to an AMR.

- Pneumatic actuator. The statements of consideration of the license renewal rule provide the basis for excluding SCs that perform their intended functions with moving parts or with a change in configuration or properties. Although the valve body is subject to an AMR, the pneumatic actuator is not.

- Actuator housing. The component type of valve (including hydrant) used in LRA Table 2.3.3-14 includes the actuator housing.

- Dikes. No outdoor tanks fall under the D (augmented) classification as established by RG 1.26, and no associated dikes are provided for the tanks.

- Storage tanks (fire water system). The only fire water tank used at WCGS is located in administration building B. The administration building fire water tank has no intended function and is not within the scope of license renewal.

- Buried underground fuel tanks. The fuel oil tank for the diesel driven fire pump is located above ground.

- Expansion tank. The fire protection system includes many tanks including the diesel oil day tanks, Halon storage tanks, foam concentrator tank, and propane tanks. There are no tanks specifically called an "expansion" tank. Tanks within the scope of license renewal are included under the component type of tank in LRA Table 2.3.3-14.

- Jacket cooling water keepwarm pump and heater. There are no jacket cooling water keepwarm pumps and heaters associated with the fire protection system.

- Lubricating oil collection system components (reactor coolant pumps). The reactor coolant pump lubricating oil collection system components will be added to the scope of license renewal.

- Lubricating oil cooler. The diesel driven fire pump engine has an integral oil cooler. The oil cooler is integral to the diesel engine and is evaluated as part of the engine. The diesel engine is an active component and not subject to an AMR.

- Auxiliary lubricating oil makeup tank. The fire protection system includes the diesel oil day tank. The diesel oil day tank is within the scope of license renewal and is included under the component type of tank in LRA Table 2.3.3-14.

- Rocker lubricating oil pump. There are no rocker lubricating oil pumps associated with the diesel fire pump engine. Rocker oil pumps associated with the emergency diesel engine system are within the scope of license renewal and are included under the component type of pump in LRA Table 2.3.3-16.

- Water floor drains. Floor drains are evaluated in the floor and equipment drains system and oily waste system in LRA Sections 2.3.3.17 and 2.3.3.18.

- Flame retardant coating for cables. There are no flame retardant coatings for cables at WCGS. Cables are protected by ceramic fiber wraps, which are evaluated as a *structural component type of fire barrier coatings and /or wraps included in the* structures evaluations of LRA Section 2.4.

- Fire barrier penetration seals. Fire barrier penetration seals are evaluated as a structural component type of fire barrier seals included in the structures evaluations of LRA Section 2.4.

- Fire barrier walls, ceilings, floor and slabs. These are structural component type group elements and are evaluated as a structural component type of concrete elements included in the structures evaluations of LRA Section 2.4.

- Fire doors. Fire doors are evaluated as a structural component type of fire barrier doors included in the structures evaluations of LRA Section 2.4.

- Fire rated enclosures. Fire rated enclosures that protect individual component, such as cable tray, are evaluated as a structural component type of fire barrier coatings and/or wraps. Fire rated enclosures that protect rooms or buildings are evaluated as a structural component type of concrete elements or concrete block (masonry walls). All of these component types are included in the structures evaluations of LRA Section 2.4.

- Fire retardant coating for structural steel supporting wall and concrete. Fire retardant coating for structural steel supporting wall and concrete are evaluated as a structural component type of fire barrier coatings and/or wraps included in the structures evaluations of LRA Section 2.4.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-4 acceptable because the applicant considered some of these components to be included within commodity groups. Therefore, the LRA does not list (or is not required to list) all these components specifically. For example, the applicant grouped the pipe fitting, couplings, threaded connections, interfaces flanges, and chamber housings under the component type of piping in LRA Table 2.3.3.-14. The applicant also explained that only components with an intended function (other than pressure boundary) are listed separately.

In addition, by letter dated August 31, 2007, the applicant amended LRA Tables 2.3.3-14 and 3.3.3.14 to include the engine muffler, sight gauge, and the lubricating oil connection system (reactor coolant pump) within the scope of license renewal. Therefore, the staff finds that these components will be adequately managed during the period of extended operation.

The staff finds that the following components were not included in the line item descriptions in the LRA: heat-actuated devices, tank heaters, water motor alarms, latch door pull box, pneumatic actuator, and lubricating oil cooler. However, the staff recognizes that the applicant considers these components as active, which will result in more vigorous oversight of the condition and performance of the components. The staff concludes that these components were correctly excluded from the scope of license renewal and are not subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.14-4 is resolved.

In RAI 2.3.3.14-5 dated April 3, 2007, the staff noted that the USAR Table 9.5.1-2 lists various types of fire water suppression systems. The staff requested that the applicant verify whether the fire water suppression systems in the areas listed below are within 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 not, the staff requested that the applicant provides a justification for their exclusion.

Manual pre-action sprinkler system:

- north cable penetration (inside containment)

- south cable penetration (inside containment)

Automatic pre-action sprinkler system:

- fuel building rail road bay
- lower cable spreading room
- upper cable spreading room
- cable trays (auxiliary building elevation 1974'-0," 2000'-0," 2026'-0")
- diesel generator rooms
- area below turbine generator (operating floor and mezzanine floor)
- turbine generator

Manual water spray system:

- auxiliary feedwater pump (turbine driven)
- steam generator feed pump

Automatic wet-pipe sprinkler system:

- turbine lube oil storage room
- auxiliary boiler room
- turbine lube oil reservoir room
- condenser pit (area beneath the main condensers)
- dry waste compactor (radwaste building)
- access control area (control building)
- pipe space and tank area (control building)
- cable area above access control area
- vertical cable chases (auxiliary building)
- vertical cable chases (control building)
- auxiliary feedwater pipe chase area (auxiliary building)
- turbine building outage office

Automatic water spray system:

- hydrogen seal oil unit
- main transformer
- startup transformer
- auxiliary transformer
- station service transformer
- engineered safety feature transformer

In its response dated May 3, 2007, the applicant stated that the various types of fire water suppression systems are listed below. The first group are those within the scope of license renewal. The second group are those not within the scope of license renewal. The following fire water suppression systems are within the scope of license renewal:

Manual pre-action sprinkler system:

- north cable penetration (inside the containment) M-12KC02 (C-4)

- south cable penetration (inside the containment) M-12KC02 (C-4)

Automatic pre-action sprinkler system:

- fuel building rail road bay M-12KC03 (A-3)
- lower cable spreading room M-12KC05 (F-3)
- upper cable spreading room M-12KC05 (H-3)
- cable trays (aux bldg El.1974'-0," 2000', 2026') M-12KC05 (D-3, F-6, G-6)
- diesel generator rooms M-12KC02 (G-7, F-7)

Manual water spray system:

- auxiliary feedwater pump (turbine driven) M-12KC02 (B-2)

Automatic wet-pipe sprinkler system:

- turbine lube oil storage room M-12KC01 (C-5)
- turbine lube oil reservoir room M-12KC01 (C-6)
- dry waste compactor (radwaste building) M-12KC03 (D-3)
- access control area (control building) M-12KC02 (G-4)
- pipe space and tank area (control building) M-12KC05 (E-2)
- cable area above access control area M-12KC05 (B-7)
- vertical cable chases (auxiliary building) M-12KC05 (B-6, B-7)
- vertical cable chases (control building) M-12KC05 (D-3)
- auxiliary feedwater pipe chase area (auxiliary building) M-12KC02 (B-1)
- radwaste storage (not listed in RAI) M-12KC03 (G-5)

The following fire water suppression systems are not within the scope of license renewal. These portions of the fire water suppression system do not support WCGS post-fire safe-shutdown requirements nor are they identified in the WCGS responses to APCSB 9.5-1, Appendix A, in USAR Table 9.5A-1.

Automatic pre-action sprinkler system:

- area below turbine generator (oper. flr & mezz. flr) M-12KC01 (A-7, D-4, D-5, D-7)
- turbine generator M-12KC01 (A-5)

Manual water spray system:

- steam generator feed pump M-12KC01 (E-5, E-7)

Automatic wet-pipe sprinkler system:

- auxiliary boiler room M-12KC01 (A-3)
- condenser pit (area beneath the main condensers) M-12KC01 (A-6)
- turbine building outage office M-12KC01 (E-5)

Automatic water spray system:

• hydrogen seal oil unit	M-12KC01 (D-3)
• main transformer	M-12KC01 (E-2)
• startup transformer	M-12KC01 (H-2)
• auxiliary transformer	M-12KC01 (D-2)
• station service transformer	M-12KC01 (H-5)
• engineered safety feature transformer	M-12KC01 (H-7)

The applicant stated that the second group of water suppression systems do not support WCGS post-fire safe-shutdown requirements nor are they identified in the WCGS responses to APCSB 9.5-1, Appendix A, in USAR Table 9.5A-1.The staff finds this contrary to the WCGS USAR and fire protection SER. WCGS committed to BTP APCSB 9.5-1, Appendix A, Table 9.5A-1, to satisfy Regulatory Position A.4, "Fire Suppression Systems," by providing certain equipment for the fire protection program that are also considered important to safety.

The staff finds that the applicant's analysis of the fire protection regulation does not completely capture the fire protection SSCs required for compliance with 10 CFR 50.48. The scope of SSCs required for compliance of 10 CFR 50.48 and GDC 3 goes beyond preserving the ability to maintain safe-shutdown in the event of a fire. GDC 3 states in part, that "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." Furthermore, the general requirements provided in GDC 3 to "minimize the adverse effects of fires on SSC's important to safety" are stated to provide a general level of protection which is afforded to all systems, not only where required to prevent a loss of safe-shutdown capability. Section 50.48(a) of 10 CFR states that, "each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of Appendix A of this part." The term "important to safety" encompasses a broader scope of equipment than safety-related and safe-shutdown equipment. Though there is a focus on the protection of safety-related equipment or safe shutdown equipment, this does not imply that there is an exclusion of any equipment which protects nonsafety-related equipment. For example, in accordance with 10 CFR 50.48, some portions of suppression systems may be required in plant areas where a fire could result in the release of radioactive materials to the environment, even if no safety-related or safe-shutdown equipment is located in that particular fire area.

During a telephone conference dated June 14, 2007, the staff requested that the applicant justify why these components were not included within the scope of license renewal pursuant to 10 CFR 54.4(a)(3), as some of them are required for compliance with 10 CFR 50.48 and GDC 3.

In its response dated July 11, 2007, the applicant explained that there are two groups of water suppression systems. The applicant stated that the group of fire water suppression systems that are within the scope of license renewal as identified in RAI 2.3.3.14-5 are the systems required for compliance with 10 CFR 50.48 and GDC 3. The group of fire water suppression systems that are not within the scope of license renewal as identified in RAI 2.3.3.14-5 are systems that are used for property protection.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-5 acceptable because the applicant explained that the second group of water suppression systems are not credited for 10 CFR 50.48 and GDC 3. These systems are for property protection and for loss prevention (not required to be within the scope of license renewal). Therefore, the staff's concern described in RAI 2.3.3.14-5 is resolved

In RAI 2.3.3.14-6 dated April 3, 2007, the staff noted that the LRA Section 2.3.3.14 discusses the total flooding Halon 1301 fire suppression system for control room trenches and chases, switchgear rooms, engineered safety feature switchgear rooms, motor-generator sets room, and electrical penetration rooms. USAR Table 9.5.1-2 also discusses the total flooding Halon 1301 fire suppression system for non-vital switchgear and transformer rooms, control cabinets, and load centers. However, the total flooding Halon 1301 fire suppression system for non-vital switchgear and transformer rooms, control cabinets, and load centers does not appear in LRA Section 2.3.3.14 as within the scope of the license renewal. The staff requested that the applicant verify whether the total flooding Halon 1301 fire suppression system for non-vital switchgear and transformer rooms, control cabinets, and load centers are within 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 not, the staff requested that the applicant provides a justification for their exclusion.

In its response dated May 3, 2007, the applicant stated that the Halon 1301 fire suppression system for non-vital switchgear and transformer room, control cabinets, and load centers was evaluated and is within 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). License renewal boundary drawing LR-WCGS-KC-M12KC04 (locations E-2 & E-6) show the non-vital switchgear and transformer rooms. License renewal drawing LR-WCGS-KC-M12KC06 (location B-8) show the control cabinet and load centers.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-6 acceptable because the total flooding Halon 1301 fire suppression systems for the non-vital switchgear and transformer room, control cabinets, and load centers were identified to be within the scope of license renewal and subject to an AMR. The staff has reasonable assurance that the total flooding Halon 1301 systems for the non-vital switchgear and transformer room, control cabinets, and load centers used for fire suppression will be adequately managed during the period of extended operation. Therefore, the staff's concern described in RAI 2.3.3.14-6 is resolved.

2.3.3.14.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the 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).

2.3.3.15 Emergency Diesel Engine Fuel Oil Storage and Transfer System

2.3.3.15.1 Summary of Technical Information in the Application

LRA Section 2.3.3.15 describes the emergency diesel engine fuel oil storage and transfer system, which stores fuel oil onsite, delivers it to the emergency diesel engines as required for operation during DBEs. The system consists of an underground storage tank with a transfer pump, day tank, strainers, filters, piping, and valves for each emergency diesel engine.

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

LRA Table 2.3.3-15 identifies emergency diesel engine fuel oil storage and transfer system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- instrument
- piping
- pump
- strainer
- tank
- tubing
- valve

The intended functions of the emergency diesel engine fuel oil storage and transfer system component types within the scope of license renewal include:

- filtration
- pressure boundary
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.15.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.15 and USAR Section 9.5.4 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.15 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 2.3.3.15-1 dated April 3, 2007, the staff stated that a license renewal drawing shows flame arresters on the emergency fuel oil storage tanks and the emergency fuel oil day tanks not highlighted as within the scope of license renewal. The staff requested that the applicant clarify whether these flame arresters should be within the scope of license renewal in accordance with 10 CFR 54.4(a). If not, the staff requested that the applicant justify their exclusion.

In its response dated May 2, 2007, the applicant stated that flame arrestors FA-0001A, FA-0001B, FA-0002A and FA-0002B, will be added to the scope of license renewal. By letter dated August 31, 2007, the applicant amended the LRA to include the component type flame arrestor to LRA Tables 2.3.3-15 and 3.3.2-15.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.15-1 acceptable because it adequately identified that the flame arrestors should have been included within the scope of license renewal. The applicant amended the LRA to identify these components as component types meeting the criteria of 10 CFR 54.4(a). Therefore, the staff's concern described in RAI 2.3.3.15-1 is resolved.

2.3.3.15.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the emergency diesel engine fuel oil storage and transfer 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).

2.3.3.16 Emergency Diesel Engine System

2.3.3.16.1 Summary of Technical Information in the Application

LRA Section 2.3.3.16 describes the emergency diesel engine system, which supplies emergency power for the essential loads necessary to shut down, cool, and isolate the reactor. The emergency diesel engine system provides emergency power in the event of a loss of offsite power and includes the following four subsystems: emergency diesel engine cooling water system, emergency diesel engine starting system, emergency diesel engine lubrication system, and emergency diesel engine combustion air intake and exhaust system.

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

LRA Table 2.3.3-16 identifies emergency diesel engine system component types within the scope of license renewal and subject to an AMR:

- expansion joint
- filter
- heat exchanger shell side
- heat exchanger tube side
- heater
- insulation
- piping
- pump
- separator
- sight gauge
- silencer
- strainer
- tank
- tubing
- thermowell
- valve

The intended functions of the emergency diesel engine system component types within the scope of license renewal include:

- filtration
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.16.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.16 and USAR Sections 8.3.1.1.2, 8.3.1.1.3, 9.5.5, 9.5.6, 9.5.7, and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.16 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 2.3.3.16-1 dated April 3, 2007, the staff stated that the standby diesel generator jacket water expansion tanks are within the safety-related boundary and are highlighted in green in the license renewal drawing for meeting the requirements of 10 CFR 54.4(a)(1). Additionally, the staff noted that each tank has several lines extending from it that appear to be safety-related; however, these lines are not highlighted and are not shown as within the scope of license renewal. The staff requested that the applicant justify the exclusion of these lines from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the LRBDs on which the subject piping is shown are the chemical addition fittings inside of safety-related boundary flags. The applicant further identified that actual piping lines however, are not safety-related because the safety-related boundary is at the tank itself. Additionally the applicant stated that, the function of the piping lines are to provide tank makeup water, an overflow path, and vents. The applicant stated that these piping connections are above the tank's normal water level and that the tank is vented to atmosphere. Failure of the piping would not create a leakage path that could drain the tanks.

During a telephone conference dated June 8, 2007, the staff noted that in the LRA, the standby diesel generator jacket water expansion tank vents are excluded from the scope of license renewal and are not subject to an AMR. The staff explained that this is not consistent with the requirements of 10 CFR 54.4(a)(2) because the tank vents are nonsafety-related components whose failure could prevent the satisfactory accomplishment of safety functions. On the basis that the vents allow the exchange of air in response to tank level changes, the staff believes that they should be within the scope of license renewal and managed to prevent their plugging.

In its response dated July 11, 2007, the applicant stated that it agreed with the staff's position discussed during the telephone conference. Further, the applicant stated that the vent line for the emergency diesel engine jacket water expansion tanks will be included within the scope of license renewal. By letter dated August 31, 2007, the applicant amended LRA Table 2.3.3.16 to reflect the addition of the vents as generic piping with an intended function of leakage boundary spatial. The applicant also amended LRA Table 3.3.2-16 to reflect the addition of the vents as generic piping with an internal environment of wetted gas (internal).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-1 acceptable because the applicant adequately included the standby emergency diesel generator jacket water expansion tank vent piping within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.16-1 is resolved.

In RAI 2.3.3.16-2 dated April 3, 2007, the staff stated that flexible connections in the standby diesel generator cooling water system are shown on a license renewal drawing. Additionally, the staff noted that the flexible connections are within the safety-related boundary and are shown to be within the scope of license renewal; however, they are not identified in LRA Tables 2.3.3-16 and 3.3.2-16. The staff requested that the applicant justify the exclusion of the flexible connections from the scope of license renewal in the jacket cooling water portion of the emergency diesel engine system.

In its response dated May 2, 2007, the applicant stated that flexible connections associated with the standby diesel engine system cooling water system will be added to LRA Tables 2.3.3-16 and 3.3.2-16. By letter dated August 31, 2007, the applicant amended the LRA to include the component type of flex connectors with an intended function of pressure boundary.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-2 acceptable because the applicant adequately included the flexible connections in question within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.16-2 is resolved.

In RAI 2.3.3.16-3 dated April 3, 2007, the staff stated that flow orifices in the standby diesel generator cooling water system are shown on a license renewal drawing. The staff also noted that the flow orifices are within the safety-related boundary and are shown to be within the scope of license renewal; however, they are not identified on LRA Tables 2.3.3-16 and 3.3.2-16. The staff requested that the applicant justify the exclusion of the flow orifices from the scope of license renewal in the jacket cooling water portion of the emergency diesel engine system.

In its response dated May 2, 2007, the applicant stated that orifices FO0001A, FO0101A, FO0003A, FO0003B, FO0004A, FO0004B, FO0005A, and FO0005B associated with the standby diesel engine system meeting the requirements of 10 CFR 54.4(a)(1) will be added to the scope of license renewal. By letter dated August 31, 2007, the applicant amended LRA Tables 2.3.3-16 and 3.3.2-16 to include the component type orifice with an intended function of pressure boundary.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-3 acceptable because it adequately included the flow orifices in question within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.16-3 is resolved.

In RAI 2.3.3.16-4 dated April 3, 2007, the staff stated that lube oil auxiliary tanks for the standby diesel generator lube oil system are shown on license renewal drawings. Additionally, the staff noted that although these tanks are within the safety-related boundary and are shown as within the scope of license renewal; however, several lines extending from these tanks are not shown as within the scope of license renewal. The staff requested that the applicant justify the exclusion of these lines from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the LRBDs on which the subject piping is shown are the nonsafety-related tank oil fill, tank overflow, and tank vent lines and that the safety-related boundary is at the tank itself. The applicant stated that because these piping lines are not included in this boundary, they are excluded from the scope of license renewal. The applicant also stated that failure of the piping would not create a leakage path that could drain the tanks. Additionally, in its response to RAI 2.3.3.16-5 on a related topic, the applicant explained that the auxiliary lubricating oil makeup tank is not required for at least seven days after the onset of continuous standby diesel engine operation and that the main engine sump is designed to provide sufficient oil for at least seven days without replenishment as identified in USAR Section 9.5.7.2.1.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-4, along with the information provided in the response to RAI 2.3.3.16-5, acceptable because it adequately explained that the tank's function is only required beyond seven days after onset of continuous standby diesel engine operation. Therefore, the staff's concern described in RAI 2.3.3.16-4 is resolved.

In RAI 2.3.3.16-5 dated April 3, 2007, the staff stated that standby diesel generator lube oil expansion tanks are shown on a license renewal drawing as within the safety-related boundary and within the scope of license renewal. The staff also noted that each tank has a vent line supporting the operation of the tanks that are excluded from the scope of license renewal. The staff requested that the applicant justify the exclusion of the vent lines from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the auxiliary lubricating oil makeup tank (makeup capability) is not required for at least seven days after the onset of continuous standby diesel engine operation and that the main engine sump is designed to provide sufficient oil for at least seven days without replenishment consistent with USAR Section 9.5.7.2.1. The applicant confirmed that the tank's vent lines have no intended function and are not within the scope of license renewal. Additionally, the applicant described the tank's configuration and design basis which provided information that was not available in the LRA.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-5 acceptable because it adequately explained the design basis for the tank's construction, configuration, and functions. Therefore, the staff's concern described in RAI 2.3.3.16-5 is resolved.

In RAI 2.3.3.16-6 dated April 3, 2007, the staff stated that flexible connections in the standby diesel generator lube oil system are shown on a license renewal drawing. The staff noted that the flexible connections are within the safety-related boundary and are shown to be within the scope of license renewal. However, they are not identified in LRA Tables 2.3.3-16 and 3.3.2-16. The staff requested that the applicant justify the exclusion of the flexible connections from the scope of license renewal in the lube oil portion of the emergency diesel engine system.

In its response dated May 2, 2007, the applicant stated that flexible connections associated with the standby diesel engine system lube oil system will be added to LRA Tables 2.3.3-16 and 3.3.2-16. By letter dated August 31, 2007, the applicant amended the LRA to include the component type of flex connectors with an intended function of pressure boundary.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.16-6 acceptable because it adequately included the flexible connections in question within the scope of license renewal. Therefore, the concern described in RAI 2.3.3.16-6 is resolved.

2.3.3.16.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the emergency diesel engine 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).

2.3.3.17 Floor and Equipment Drains System

2.3.3.17.1 Summary of Technical Information in the Application

LRA Section 2.3.3.17 describes the floor and equipment drains system, which warns or activates alarms of potential flooding conditions in the containment, RHR pump rooms, control building, fuel building, and auxiliary building, and isolates discharge of RHR, auxiliary building, and control building sumps on the safety injection signal to prevent the pumping of potentially radioactive water to other parts of the plant. Additionally, the system provides containment isolation for one piping penetration and collects RCP oil to prevent an oil fire in the reactor building. The floor and equipment drains system identifies gross pipe ruptures or failures that could raise the water levels and flood safety-related systems. Safety-related level instrumentation for the sumps in the auxiliary building, RHR pump rooms, control building, and containment together with the plant computer determine leak rates in the subject buildings. Redundant safety-related sump pump discharge isolation valves isolate on any safety injection system signal and prevent discharge of the control building, auxiliary building, and RHR pump room sump pumps from leaving the auxiliary building. The floor and equipment drains system consists of three subsystems: the dirty radwaste drain subsystem, the clean radwaste drain subsystem, and the leak detection subsystem, piping, valves, and instrumentation.

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

LRA Table 2.3.3-17 identifies floor and equipment drains system component types within the scope of license renewal and subject to an AMR:

- bellows
- closure bolting
- flame arrestor
- piping
- sight gauge
- tank
- tubing
- valve

The intended functions of the floor and equipment drains system component types within the scope of license renewal include:

- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.17.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.17 and USAR Section 9.3.3 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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).

2.3.3.17.3 Conclusion

The staff reviewed the LRA, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the floor and equipment drains 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).

2.3.3.18 Oily Waste System

2.3.3.18.1 Summary of Technical Information in the Application

LRA Section 2.3.3.18 describes the oily waste system, which has safety-related indicators in the basement of the control building and in the diesel generator room to indicate potential flooding conditions in those areas. These level indicators indicate events which could prevent the capability to shut down the reactor and maintain it in a safe shutdown condition. The oily waste system collects nonradioactive potentially oily liquid waste from the turbine building, diesel generator building, communications corridor, control building, and selected areas of the auxiliary building. Other floor and equipment drains are scoped as part of the floor and equipment drains system and miscellaneous drains system. The oily waste system detects gross water leakage and/or accumulation in the diesel generator and control building oily waste sumps and alerts station operators. The portion of the oily waste system serving the control room includes a loop seal that facilitates control room pressurization. The portion of the oily waste system serving the containment mini-purge supply unit includes a loop seal that prevents flow of air through the oily waste system. The loop seals and piping are classified as nonsafety-related.

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

LRA Table 2.3.3-18 identifies oily waste system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping
- valve

The intended function of the oily waste system component types within the scope of license renewal is to maintain mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs.

2.3.3.18.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.18 and USAR Section 9.3.3.2.1.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.3.18 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 2.3.3.18-1 dated April 3, 2007, the staff stated that license renewal drawings show piping from the discharge of the auxiliary feed pump room sump pumps and the diesel generator building sump pumps as nonsafety-related components affecting safety-related components due to spatial interaction. However, the staff noted that the pumps themself are not designated as nonsafety-related components affecting safety-related components even though they appear to be in close proximity to safety-related components. The staff requested that the applicant provides a description of the portions of the nonsafety-related oily waste system that are within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) due to spatial interaction. In addition, the staff requested that the applicant discuss the reason for terminating the scoping boundaries where indicated.

In its response dated May 2, 2007, the applicant stated that the discharge of the auxiliary feed pump room sump pumps is within the scope of license renewal from the floor between area 115 (room 1128) and area 125, and ends at the wall between the auxiliary building and the turbine building. The applicant stated, for the auxiliary feed pump room sump pump discharge piping, that there are no safety-related components in the turbine building that would be affected by spatial interactions with the auxiliary feed pump room sump pump discharge piping. Additionally, the applicant explained that the sump pumps are submerged below the floor elevation of room 1128 and are enclosed by the sump covers; therefore, do not have spatial interaction with safety-related components above the floor. The applicant explained that although there are no safety-related components in room 1128 that would be affected by the sump pumps discharge lines, it was determined that the oily waste system piping in room 1128 will be added to the scope of license renewal due to potential interaction with safety-related components in the adjacent room 1122 and will include piping from the sump covers to the piping currently highlighted on drawing LR-WCGS-LE-M-12LE01.

For the discharge of diesel generator building sump pumps PLE06A/B/C/D, the applicant explained that piping is within the scope of license renewal from the sump covers in area 511 through area 132 in the auxiliary building where the discharge lines are merged, and ends at the penetration between area 132 and area 332. Additionally, the applicant explained that there are no safety-related components in area 332 that would be affected by the sump pump discharge lines and that the diesel generator building sump pumps are submerged below the floor elevation and are enclosed by the sump covers. Therefore, they do not have spatial interaction with safety-related components above the floor.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.18-1 acceptable because it adequately explained the reasons for terminating the scoping boundaries for the auxiliary feedwater pump room sump pump discharge piping and the diesel generator building sump pump discharge piping indicated on the LRBDs. Additionally the applicant expanded the scoping boundaries on the discharge piping of the auxiliary feedwater pump room sump pumps due to potential spatial interaction. Therefore, the staff's concern described in RAI 2.3.3.18-1 is resolved.

2.3.3.18.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the oily waste 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).

2.3.3.19 Cranes, Hoists and Elevators System

2.3.3.19.1 Summary of Technical Information in the Application

LRA Section 2.3.3.19 describes the cranes, hoists, and elevators system, which supports and restrains the equipment hatch missile shield for containment to be operable. The reactor building houses and supports the reactor, reactor coolant piping, steam generators, pressurizer, RCPs, accumulators, and the containment air coolers. It protects these SSCs from external hazards and contains radioactive material after a design-basis accident. The reactor building must prevent and mitigate the consequences of accidents that could cause offsite exposure. The cranes, hoists, and elevators system provides lifting and maneuvering capacity in the containment building, fuel building, diesel generator building, auxiliary building, and various nonsafety-related buildings and shops about the site. This system is composed of multiple cranes, doors, elevators, hoists, monorails, man-lifts, and trolleys.

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

LRA Table 2.3.3-19 identifies cranes, hoists and elevators system component types within the scope of license renewal and subject to an AMR:

- crane
- hoist (including monorail)
- trolley

The intended functions of the cranes, hoists, and elevators system component types within the scope of license renewal include:

- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.3.3.19.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.19 and USAR Section 3.8.2.1.1 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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).

2.3.3.19.3 Conclusion

The staff reviewed the LRA, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the cranes, hoists, and elevators 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 Turbine Building HVAC System

2.3.3.20.1 Summary of Technical Information in the Application

LRA Section 2.3.3.20 describes the turbine building HVAC system, which isolates the auxiliary building HVAC system upon receipt of a safety injection signal, and as such is safety-related. The turbine building HVAC system consists of the following nine subsystems:

- main building HVAC
- lube oil room HVAC
- computer room HVAC
- instrument shop HVAC
- condenser air removal filtration subsystem
- battery room HVAC
- electrohydraulic control cabinet alternating current (A/C)
- oxygen control and pH control chemical storage A/C subsystem
- turbine deck office mezzanine room A/C

The main building HVAC provides outside air for ventilation and cooling of the turbine building. The lube oil room HVAC provides outside air for ventilation, cooling, and heating as required for equipment in the lube oil room. The computer room and instrument shop HVAC maintains a suitable environment for personnel and equipment. The condenser air removal filtration subsystem collects and processes the noncondensable gases from the condenser. The battery room HVAC is used for dilution of hydrogen emitted by the batteries. The electrohydraulic control cabinet A/C provides room air-conditioning for a suitable environment for equipment. The oxygen control and pH control chemical storage A/C subsystem provides room cooling and exhausts air from fume hoods. The turbine deck office mezzanine room A/C provides a suitable environment for personnel comfort.

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

LRA Table 2.3.3-20 identifies turbine building HVAC system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- damper
- ductwork
- flex connector

The intended functions of the turbine building HVAC system component types within the scope of license renewal include:

- rated fire barrier to confine or retard a fire from spreading
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs

2.3.3.20.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.20 and USAR Section 9.4.4 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 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 2.3.3.20-1 dated April 18, 2007, the staff requested that the applicant clarify if the damper housings, fire dampers, and fire damper housings are within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the component types that are subject to an AMR and are highlighted in license renewal drawings LR-WCGS-GE-M-12GE01 and LR-WCGS-GE-M-12GE02 are included in the component types listed in LRA Table 2.3.3-20. The applicant clarified that the damper housings, including the fire damper housings, are included within the category or commodity group of damper.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.20-1 acceptable because it clarified that the damper housings are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.3.20-1 is resolved.

2.3.3.20.3 *Conclusion*

The staff reviewed the LRA, USAR, drawings, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the turbine building HVAC 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).

2.3.3.21 Systems Within the Scope of License Renewal Based Only on the Criterion of 10 CFR 54.4(a)(2)

2.3.3.21.1 Summary of Technical Information in the Application

LRA Section 2.3.3.21 describes the miscellaneous auxiliary systems within the scope of license renewal only for criterion 10 CFR 54.4(a)(2) (for nonsafety-related SSC), including:

- service water system
- ESW chemical addition system
- chemical and detergent waste system
- gaseous radwaste system
- demineralized water makeup storage and transfer system
- domestic water system

- plant heating system
- boron recycle system
- central chilled water system
- yard drainage system
- secondary liquid waste system

The service water system provides cooling water to plant auxiliary equipment during normal plant operations and normal plant shutdown and transfers the heat to the circulating water system, the UHS, and the ESWS. The ESW chemical addition system provides for the chemical treatment of the ESWS to prevent organic fouling. The chemical and detergent waste system collects chemical, wash-down, and detergent waste from plant facilities and transfers the waste for processing and recycling. The gaseous radwaste system controls, collects, processes, stores, and disposes of gaseous radioactive wastes generated by normal operation, including anticipated operational occurrences.

The demineralized water makeup storage and transfer system stores water for use upon demand for makeup within the plant. The domestic water system provides chlorinated potable water for drinking, cooking, showers, laundry, and toilet facilities within the standardized power block. The plant heating system heats air to maintain a suitable environment for personnel and equipment. The boron recycle system receives reactor coolant effluent for storage until its reuse or disposal by processing through the liquid radwaste system. The central chilled water system cools air handling equipment so plant ventilation can maintain a suitable environment for personnel and equipment.

The yard drainage system transfers accumulated water in-leakage from various below-grade electrical manholes, the ESW "B" train valve house, and the turbine building cable pit sump to the site storm drainage system. The secondary liquid waste system processes and recycles turbine building waste and condensate demineralizer regeneration waste products back to the condenser or discharges waste to the environment if within the limits of release.

The failure of nonsafety-related SSCs in the miscellaneous auxiliary systems in-scope only for criterion 10 CFR 54.4(a)(2) could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-21 identifies miscellaneous auxiliary systems in-scope only for criterion 10 CFR 54.4(a)(2) component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow element
- orifice
- piping
- pump
- strainer
- tank
- tubing
- valve

The intended functions of the miscellaneous auxiliary systems in-scope only for criterion 10 CFR 54.4(a)(2) component types within the scope of license renewal include:

- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- structural and/or functional support to safety-related components
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.3.21.2 Staff Evaluation

The staff reviewed the service water system, as described in LRA Section 2.3.3.21 and USAR Sections 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the service water system as described in LRA Section 2.3.3.21A, 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 2.3.3.21-1 dated April 3, 2007, the staff noted that LRA Section 2.3.3.21 states that systems meeting the criterion of 10 CFR 54.4(a)(2) are within the scope of license renewal and that each mechanical system was reviewed to determine whether safety-related systems could be impacted adversely by nonsafety-related portions of systems. In part 1 of the RAI, the staff noted that a license renewal drawing for the nonsafety-related service water system shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the nonsafety-related service water system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawing LR-WCGS-EA-M-12EA01, service water system components are within the scope of license renewal for meeting the requirements for 10 CFR 54.4(a)(2) due to spatial interaction and that fluid-filled service water components have spatial interaction with safety-related components in the auxiliary building and in the control building. The applicant further explained that service water system piping lines EA002HBD-30, EA003HBD-30, EA058HBD-30 and EA059HBD-30 shown on this license renewal drawing are within the scope of license renewal because they provide structural integrity to attached safety-related piping in the control building. The boundary for this piping ends where they become buried between the control building and the communication corridor.

The applicant also stated that service water system piping lines EA004HBD-6 and EA005HBD-6 shown on license renewal drawing LR-WCGS-EA-M-12EA01 have their spatial interaction termination points where the fluid-filled piping exits the auxiliary building and enters the turbine building since the turbine building contains no safety-related components.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, part 1, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 1, is resolved.

The staff reviewed the ESWS chemical addition system as described in LRA Section 2.3.3.21 and USAR Section 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 verified the system functions described in the LRA and USAR to ensure that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 10 CFR 54.4(a). The staff then verified those components that the applicant has identified as within the scope of license renewal to ensure 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 reviewed the chemical and detergent waste system as described in LRA Section 2.3.3.21 and USAR Section 9.3.3 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the chemical and detergent waste system as described in LRA Section 2.3.3.21C, 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, part 2, dated April 3, 2007, the staff noted that a license renewal drawing for the chemical and detergent waste system shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the chemical and detergent waste system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawing LR-WCGS-LD-M-12LD01, chemical and detergent waste system components are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction and that fluid-filled chemical and detergent waste system components have spatial interaction with safety-related components in the auxiliary building and in the control building.

The applicant also stated that the chemical and detergent waste system piping lines LD042HCD-2 and LD027HCD-3 shown on this drawing have spatial interaction termination points where the fluid-filled piping lines leave the auxiliary building and enter the radwaste tunnel, which has no safety-related equipment.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, part 2, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 2 is resolved.

The staff reviewed the gaseous radwaste system as described in LRA Section 2.3.3.21 and USAR Sections 9.3.4 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, the staff evaluated the system functions described in the LRA and USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 reviewed the demineralized water makeup storage transfer system as described in LRA Section 2.3.3.21 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the demineralized water makeup storage and transfer system as described in LRA Section 2.3.3.21E, 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, part 3, dated April 3, 2007, the staff noted that a license renewal drawing for the demineralized water makeup storage and transfer system shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the demineralized water makeup storage and transfer system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawing LR-WCGS-AN-M-12AN01, demineralized water storage and transfer system components are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction and that fluid-filled demineralized water storage and transfer system components have spatial interaction with safety-related components in the auxiliary building. The applicant further explained that demineralized water storage and transfer system piping line AN042HCD-3 shown on this drawing has spatial interaction termination points where the fluid-filled piping line leaves the auxiliary building and enter the radwaste pipe tunnel and where the fluid-filled piping line leaves the auxiliary building and enters the turbine building, which has no safety-related equipment.

The applicant also stated that demineralized water storage and transfer system piping line AN050HCD-4 has a spatial interaction termination point where the fluid-filled piping line leaves the auxiliary building and enters the communications corridor, which has no safety-related equipment.

The applicant also stated that stated that demineralized water storage and transfer system piping line AN028HCD-2 has a spatial interaction termination point where the fluid-filled piping line leaves the auxiliary building and enters the radwaste tunnel, which has no safety-related equipment.

The applicant lastly stated that demineralized water storage and transfer system piping lines AN004HCD-1, AN015HCD-2 and AN019HCD-1 have spatial interaction termination points where the fluid-filled piping lines leave the turbine building enter the auxiliary building and then re-enter the turbine building, which has no safety-related equipment.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, part 3, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 3, is resolved.

The staff reviewed the domestic water system as described in LRA Section 2.3.3.21 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the domestic water system as described in LRA Section 2.3.3.21F, 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, part 4, dated April 3, 2007, the staff noted that a license renewal drawing for the domestic water system shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the domestic water system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawings LR-WCGS-KD-M-12KD01 and LR-WCGS-KD-M-12KD02, domestic water system components are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction and that fluid-filled domestic water system components have spatial interaction with safety-related components in the auxiliary building, the control building and the fuel building.

The applicant further explained that domestic water system boundary drawings LR-WCGS-KD-M12KD01 and LR-WCGS-KD-M-12KD02 have been revised to clarify domestic water component spatial interaction ends points and has provided revised drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, part 4, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 4, is resolved.

The staff reviewed the plant heating system as described in LRA Section 2.3.3.21 and USAR Sections 9.4.9 and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the plant heating system as described in LRA Section 2.3.3.21G, 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, part 5, dated April 3, 2007, the staff noted that a license renewal drawing for the plant heating system, shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the plant heating system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawing LR-WCGS-GA-M-12GA02, plant heating system components are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction and that fluid-filled plant heating system components have spatial interaction with safety-related components in the auxiliary building, the control building, and the fuel building.

The applicant further explained that plant heating system piping lines GA095HBD-3 and GA096HBD-3 as shown on this drawing have spatial interaction termination points where fluid-filled piping leaves the auxiliary building and enters the radwaste tunnel, which has no safety-related equipment.

The applicant also explained that plant heating system piping lines GA064HBD-1 ½ and GA065HBD-1 ½ have spatial interaction termination points where the fluid-filled piping transitions from auxiliary building, BLA133 to 136, which contains no safety-related equipment. In its response, the applicant provided additional isometric drawings referenced in LR-WCGS-GA-M-12GA02 for these piping lines, which depict penetration points.

Lastly, the applicant stated that plant heating system piping lines GA003HBD-6 and GA090HBD-6 have spatial interaction termination points where the fluid-filled piping transitions from the auxiliary building to the communications corridor, which contains no safety-related equipment.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, part 5, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Additionally, the applicant provided drawings that identify piping penetrations for areas in the auxiliary building that contains no safety-related components. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 5, is resolved.

The staff reviewed the boron recycle system as described in LRA Section 2.3.3.21 and USAR Section 9.3.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions pursuant to10 CFR 54.4(a). The staff then reviewed those components that the applicant 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 reviewed the central chilled water system as described in LRA Section 2.3.3.21 and USAR Section 9.4.10 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the central chilled water system as described in 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, part 6, dated April 3, 2007, the staff noted that a license renewal drawing for the central chilled water system shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the central chilled water system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawing LR-WCGS-GB-M-12GB01, central chilled water system components are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial *interaction and that fluid-filled central chilled water system components have spatial interaction* with safety-related components in the auxiliary building.

The applicant further explained that the central chilled water system piping lines GB061HBD-3 and GB072HBD-3 shown on this drawing have spatial interaction termination points where the fluid-filled piping transitions from the auxiliary building to the radwaste tunnel, which contains no safety-related equipment.

The applicant also explained that the central chilled water system piping lines GB037HBD-1 and GB038HBD-1 have spatial interaction termination points where the fluid-filled piping transitions from auxiliary BLA 133 to 136, which contains no safety-related equipment. In its response, the applicant provided additional isometric drawings referenced in LR-WCGS-GA-M-12GB01 for these piping lines, which depict penetration points.

The applicant also explained that the central chilled water system piping line GB065HBD-8 has a spatial interaction termination point where the fluid-filled piping transitions from the auxiliary building to the communications corridor, which has no safety-related equipment.

The applicant also explained the central chilled water system piping line GB008HBD-8 has a spatial interaction termination point where the fluid-filled piping transitions from the auxiliary building to the communications corridor, which has no safety-related equipment. Also, the central chilled water system piping lines GB016HBD-1 ½ and GB015HBD-1 ½ have spatial interaction termination points where fluid-filled piping transitions from the control building to the communications corridor, which contains no safety-related equipment.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, *part* 6, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Additionally, the applicant provided drawings that identify piping penetrations for areas in the auxiliary building that contains no safety-related components. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 6, is resolved.

The staff reviewed the yard drainage system as described in LRA Section 2.3.3.21 the site storm drain system as described in USAR Section 2.4.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 reviewed the secondary liquid waste system as described in LRA Section 2.3.3.21 and USAR Section 10.4 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 the secondary liquid waste system as described in 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, part 7, dated April 3, 2007, the staff noted that license renewal drawings for the secondary liquid waste system shows system portions highlighted in red and ending with no further explanation. The staff requested that the applicant provides a description of the portions of the secondary liquid waste system that are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction.

In its response dated May 2, 2007, the applicant stated that, as shown on license renewal drawings LR-WCGS-HF-M-12HF01, LR-WCGS-HF-M-12HF02 and LR-WCGS-HF-M-12HF03, secondary liquid waste system components are within the scope of license renewal for meeting the requirements of 10 CFR 54.4(a)(2) due to spatial interaction and that fluid-filled secondary liquid waste system components have spatial interaction with safety-related components in the auxiliary building.

The applicant further stated that the secondary liquid waste system piping lines HF275HCD-2 shown on drawing LR-WCGS-HF-M-12HF01 and HF165HCD-3 shown on drawing LR-WCGS-HF-M-12HF03 have spatial interaction termination points where the fluid-filled piping transitions from the communications corridor, which has no safety-related equipment to the auxiliary building. The applicant further explained that these piping lines also have spatial interaction termination points where the fluid-filled piping transitions from the auxiliary building to the radwaste tunnel, which has no safety-related equipment.

The applicant also stated that the secondary liquid waste system piping line HF107-HBD-3 shown on LR-WCGS-HF-M-12HF02 has a spatial interaction termination point where the fluid-filled piping transitions from the auxiliary building to the radwaste tunnel, which has no safety-related components. The applicant further explained that this piping line also has a spatial interaction termination point where the fluid-filled piping transitions from the auxiliary building to the turbine building, which contains no safety-related piping.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.21-1, part 7, acceptable because it adequately explains the reasons for terminating the scoping boundaries at the various points in question. Therefore, the staff's concern described in RAI 2.3.3.21-1, part 7, is resolved.

2.3.3.21.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the miscellaneous auxiliary systems in-scope only for criterion 10 CFR 54.4(a)(2) 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).

2.3.4 Steam and Power Conversion Systems

In LRA Section 2.3.4, the applicant identified the SCs of the steam and power conversion systems that are subject to an AMR for license renewal.
The applicant described the supporting SCs of the steam and power conversion systems in the following LRA sections:

- 2.3.4.1 main turbine system
- 2.3.4.2 main steam system
- 2.3.4.3 feedwater system
- 2.3.4.4 condensate system
- 2.3.4.5 steam generator blowdown system
- 2.3.4.6 auxiliary feedwater system

The staff's review findings regarding LRA Sections 2.3.4.1 – 2.3.4.6 are presented in SER Sections 2.3.4.1 – 2.3.4.6, respectively.

2.3.4.1 Main Turbine System

2.3.4.1.1 Summary of Technical Information in the Application

LRA Section 2.3.4.1 describes the main turbine system, which converts steam thermal energy from the main steam system to mechanical energy to drive the main generator. The system consists of a high-pressure turbine, three low-pressure turbines, four main steam stop valves, four control valves, four moisture separator reheaters, six combined intermediate valves, strainers, turbine shaft turning gear, piping, valves, and instrumentation for monitoring and turbine trip purposes.

The main turbine system performs functions that support fire protection and ATWS.

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

- closure bolting
- piping
- valve

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

2.3.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.1 and USAR Sections 10.2 and 7.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the main turbine 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).

2.3.4.2 Main Steam System

2.3.4.2.1 Summary of Technical Information in the Application

LRA Section 2.3.4.2 describes the main steam system, which removes heat from the RCS for controlled cooldown during normal, accident, and post-accident conditions. Portions of the main steam system provide containment isolation and overpressure protection for the secondary side of the steam generators and the main steam piping. The auxiliary turbines subsystem of the main steam system also provides steam as a motive force to support the operation of the turbine-driven feedwater pump and auxiliary feedwater pumps. The auxiliary steam subsystem is designed to provide the steam required for plant heating and for operation of the waste evaporator. In the event of fire in some fire areas, nonsafety-related isolation valves that interface with main steam lines are relied on to prevent uncontrolled RCS cooldown from steam flow. The main steam system includes the auxiliary steam subsystem and the auxiliary turbines subsystem. The main steam system consists of the piping systems that convey steam from the steam generators to the turbine-generator system, the branches that supply steam to the main feedwater pump turbines, auxiliary feedwater pump turbine, reheaters, and main turbine gland seals. Each main steam line has one power-operated atmospheric relief valve, five spring-loaded safety valves, one main steam isolation valve (MSIV) and its bypass, a cross-tie header downstream of the MSIVs, and vent and drain valves. The steam piping system from the MSIVs to the main turbine is evaluated with the main turbine system. The steam to the main turbine gland seals is evaluated in turbine/generator auxiliaries.

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

LRA Table 2.3.4-2 identifies main steam system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- insulation
- orifice
- piping
- strainer
- trap
- tubing
- turbine
- valve
- flex hoses
- pump
- sight glass
- silencer
- tank

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

- flow restriction
- filtration
- heat loss control
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components
- direct flow

2.3.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.2 and USAR Sections 10.3, 10.4.4, 7.3.8, 7.4, and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 2.3.4.2 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 2.3.4.2-1 dated April 3, 2007, the staff stated that a license renewal drawing shows four atmospheric relief valves silencers excluded from the scope of license renewal. The staff noted that the silencers are attached to piping which are within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff requested that the applicant explain why the silencers are not within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff also requested that the applicant describe the physical configuration of the silencers such that if they fail they will not prevent the atmospheric relief valves from performing their intended function.

In its response dated May 2, 2007, the applicant stated that the nonsafety-related atmospheric relief valve exhaust pipes are within the scope of license renewal as required by 10 CFR 54.4(a)(2) based on the possibility of spatial interaction with safety-related components in the area. The applicant further explained that the exhaust pipes are of seismic category II/I and that the silencers connected to the end of the exhaust pipes are located on the roof area and do not have spatial interaction effects on any safety-related components. Additionally the applicant explained that the silencers do not provide any support for the structural integrity of any safety-related component and that based on the details of the location and structural supports of the exhaust silencers on the roof area, the failure of the silencers will not prevent the atmospheric relief valves from performing their intended function.

During a telephone conference dated June 8, 2007, the staff explained that the response did not adequately address the potential effects of a degraded atmospheric relief valve exhaust silencer on the intended function of the atmospheric relief valves. The staff finds that the applicant's response is not consistent with the requirements of 10 CFR 54.4(a)(2) because the atmospheric relief valve silencers are nonsafety-related components whose failure could prevent the satisfactory accomplishment of safety functions. The atmospheric relief valves have an intended function meeting 10 CFR 54.4(a)(1)(ii) in order to maintain a safe shutdown condition. The staff believes that if the relief valve's exhaust paths were impeded by degraded silencers the valve's intended function would be affected and; therefore, the silencers should also be within the scope of license renewal.

In its response dated July 11, 2007, the applicant stated that it agreed with the staff's position. Further, the applicant stated that the atmospheric relief valves exhaust silencers (in addition to exhaust pipes) will be included within the scope of license renewal. By letter dated August 31, 2007, the applicant amended LRA Table 2.3.4-2 to reflect the addition of the silencers as a component type with an intended function of direct flow. The applicant also amended LRA Table 3.4.2-2 to reflect the addition of the silencers as a component type with an internal environment of wetted gas (internal) and an external environment of atmosphere and weather.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.2-1 acceptable because the applicant included the atmospheric relief valves exhaust silencers within the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.4.2-1 is resolved.

In RAI 2.3.4.2-2 dated April 3, 2007, the staff stated that a license renewal drawing shows steam traps excluded from the scope of license renewal. The staff noted that the steam traps are attached to 2-inch lines. The staff requested that the applicant explain why these four steam traps are not within the scope of license renewal in accordance with 10 CFR 54.4(a)(3).

In its response dated May 2, 2007, the applicant stated that the steam traps are attached to 1-inch lines through 2-inch by 1-inch reducers installed upstream of the steam traps. The applicant explained that one specific event, which causes the main steam lines in the turbine building required to support a post-fire safe-shutdown, is a fire in the main steam tunnel that causes two main steam lines to fail to isolate. The applicant explained that the valves in the turbine building would be closed to isolate the main steam and prevent a rapid depressurization of the secondary side, resulting cooldown of the primary side, and potential return to criticality and that the failure of a 1-inch line, and even several 1-inch lines, was considered and determined to be insignificant. Additionally, the applicant explained that throttling one or both atmospheric relief valves closed to control depressurization could easily compensate for the loss of steam due to this event.

The applicant explained that the 1-inch lines associated with the subject steam traps are not components required for post-fire safe-shutdown; therefore, are not included within the scope of license renewal pursuant to 10CFR54.4(a)(3). The steam traps only allow the condensation to pass to the drain lines during normal operation or post-fire shutdown, and steam flow through the traps is isolated as designed.

During a telephone conference dated June 8, 2007, the staff explained that the response did not adequately address the function of the steam traps as a pressure boundary with respect to 10 CFR 54.4(a)(3) in the main steam system. Further, the staff asked that the applicant clarify whether there is an analysis or calculation that serves as the basis for the exclusion of these steam traps from the scope of license renewal.

In its response dated July 11, 2007, the applicant stated that the current WCGS licensing basis for post-fire safe-shutdown includes calculation XX-E-013 "Post-Fire Safe Shutdown Analysis." The applicant explained that this calculation evaluates the failures of components in the turbine building on lines of 1-inch or less and concludes that these failures would not adversely affect the main steam system's intended function. Further, the applicant identified that the steam traps discussed in this RAI are located on lines of 1-inch or less and; therefore, their failure would not adversely affect the main steam system and its intended functions.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.2-2 acceptable because the applicant has adequately identified the calculation as the basis for evaluating the failures of components of 1-inch or less and their exclusion from the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.4.2-2 is resolved.

In RAI 2.3.4.2-3 dated April 3, 2007, the staff stated that a license renewal drawing has a note stating "to be evaluated in LRID AE, Feedwater System" which points to reference continuation flags to other drawings. The staff requested that the applicant explain why the note references

LRID AE, when these two drawings have been associated and evaluated within the main steam system for license renewal.

In its response dated May 2, 2007, the applicant stated that the note in question is incorrect. The applicant stated that when the scoping package for the main steam system for license renewal (LRID AB) was revised to include the auxiliary turbine system, the note on license renewal drawing LR-WCGS-AB-M-12AB03 was not removed.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.2-3 acceptable because it adequately explained that the note leading to the incorrect system designator was an error on the license renewal drawing and that, it was found to have no impact on the LRA. Therefore, the staff's concern described in RAI 2.3.4.2-3 is resolved.

In RAI 2.3.4.2-4 dated April 3, 2007, the staff stated that a license renewal drawing has a note stating "This Section is evaluated in LRID AL" which points to a reference continuation flag to another drawing. The staff noted that for license renewal, the other drawing is associated with the auxiliary feedwater system. The staff requested that the applicant explain why the note references LRID AL, auxiliary feedwater system, when the referenced drawing has been associated and evaluated within the main steam system for license renewal.

In its response dated May 2, 2007, the applicant stated that the note is incorrect. The applicant stated that when the scoping package for the main steam system for license renewal (LRID AB) was revised to include the auxiliary turbine system, the note on license renewal drawing LR-WCGS-AB-M-12FB01 was not removed.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.2-4 acceptable because it adequately explained that the note leading to the incorrect system designator was an error on the license renewal drawing and that, it was found to have no impact on the LRA. Therefore, the staff's concern described in RAI 2.3.4.2-4 is resolved.

In RAI 2.3.4.2-5 dated April 3, 2007, the staff stated that license renewal drawings for the main steam system have lines highlighted in green indicating that they are within the scope of license renewal. However, the staff noted that multiple lines that are sized 1-inch and under, that branch off the highlighted lines with no valve or other interfacing components, are not highlighted. The staff requested that the applicant justify the exclusion of the size 1-inch and under lines from the scope of license renewal. In addition, the staff requested that the applicant explain whether the impact of multiple line failures were considered on the system intended functions.

In its response dated May 2, 2007, the applicant stated that the 1-inch lines (vents and drains) shown on LR-WCGS-AB-M-12AB03 are not required to support a post-fire safe-shutdown. The applicant stated that post-fire safe-shutdown would have been the only reason these components would be included within the scope of license renewal.

The one event which causes the main steam lines in the turbine building to be required to support a post-fire safe-shutdown is a fire in the main steam tunnel that causes two main steam lines to fail to isolate. Valves in the turbine building would be closed to isolate the main steam and prevent a rapid depressurization of the secondary side, resulting cooldown of the primary side, and potential return to criticality. The applicant explained that failure of a 1-inch line, and even several 1-inch lines, was considered and determined to be insignificant and by throttling one or both atmospheric relief valves closed to control depressurization, compensation for this the loss of steam due to this event could be easily accomplished.

The applicant described that the atmospheric relief valves at WCGS as 8-inch Masoneilan air operated valves capable of throttling with a seat diameter of 5.061 inches. Further, the applicant described the valve's port diameter as being slightly smaller, but still greater than 5 inches. Therefore, the applicant concluded that each atmospheric relief valve has at least 19.6 square inches of flow area and that analysis has shown that it takes a minimum of two functional atmospheric relief valves to meet the10 CFR Part 50, Appendix R, criteria of being in cold shutdown within 72 hours.

Additionally, the applicant stated that a 1-inch pipe has a flow area of less than 0.79 square inches and that although multiple pipe failures were considered, all of the 1-inch pipes failing simultaneously were considered incredible. Further explanation included that there are 31 1-inch vents and drains and seven 1/2-inch pipes in the main steam system excluded from the scope of post-fire safe-shutdown and several instrument tubes of unknown sizes, that are assumed to be 1/4-inch tubes. The applicant's analysis described that if all 38 pipes ruptured cleanly at the same time, the resulting flow area would be less than 26 square inches, or about equal to 2/3 the flow area of two atmospheric relief valves and that throttling closed on the two functional atmospheric relief valves will assure a controlled cooldown rate.

During a telephone conference dated June 8, 2007, the staff explained that the response did not adequately identify whether there is an analysis or calculation that serves as the basis for the exclusion of these 1-inch or less steam lines from the scope of license renewal.

In its response dated July 11, 2007, the applicant stated that the current WCGS licensing basis for post-fire safe-shutdown includes calculation XX-E-013 "Post-Fire Safe Shutdown Analysis." The applicant explained that this calculation evaluates the failures of components in the turbine building on lines of 1-inch or less and concludes these failures would not adversely affect the main steam system's intended function.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.2-5 acceptable because the applicant has adequately identified the calculation as the basis for evaluating the failures of components of 1-inch or less and their exclusion from the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.4.2-5 is resolved.

2.3.4.2.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and the RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the main steam 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).

2.3.4.3 Feedwater System

2.3.4.3.1 Summary of Technical Information in the Application

LRA Section 2.3.4.3 describes the feedwater system, which provides flow paths for the auxiliary feedwater to the steam generators and isolates feedwater flow to the steam generators during a main steam or feedwater line break event or a containment overpressure event. The portions inside the containment also serve as the containment barrier against fission product release to the environment. The feedwater system receives condensate from the condensate system and delivers feedwater at required pressure and temperature to the four steam generators. The system consists of two interconnected trains with turbine-driven feedwater pumps for normal power operation, a motor-driven feedwater pump for startup operation, three stages of high-pressure feedwater heaters in two parallel trains, and four lines connecting to the four steam generators. Each line has a feedwater control valve, feedwater isolation valve, and an auxiliary feedwater connection. The feedwater system also includes components that monitor the steam generator level for power operations and safe plant shutdown.

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

LRA Table 2.3.4-3 identifies feedwater system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- flow element
- heat exchanger tube side
- heat exchanger shell side
- insulation
- orifice
- piping
- thermowell
- tubing
- valve

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

- heat loss control
- pressure boundary
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.3 and USAR Sections 6.2.4 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, the staff evaluated the system functions described in the LRA and USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the feedwater 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).

2.3.4.4 Condensate System

2.3.4.4.1 Summary of Technical Information in the Application

LRA Section 2.3.4.4 describes the condensate system, which delivers deaerated water from the main condenser hotwells to the suction of the main feedwater pumps. Together with the feedwater system, the condensate system delivers feedwater to the steam generators at required pressure and temperature. The condensate storage and transfer system stores water in the CST for makeup and surge capacity to compensate for changes in plant system inventories. The condensate pumps take suction from the condenser hotwell and discharge through, or bypass, the condensate demineralizers if desired. The condensate demineralizers are evaluated in the condensate demineralizer system. At the condensate pump discharge the condensate system interfaces with the condensate and feedwater chemical addition system for oxygen and pH control, which is evaluated with the feedwater system. Downstream of the condensate demineralizers are the low-pressure feedwater heaters, which join together at a common header for the suction of the main feedwater pumps. The CST serves as a reservoir to supply or receive condensate as required by the condenser hotwell level control system.

Portions of the condensate storage and transfer system and portions of the condensate system also support fire protection and SBO requirements based on the criteria of 10 CFR 54.4(a)(3).

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

LRA Table 2.3.4-4 identifies condensate system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- piping
- tank
- valve
- rupture disc

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

- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.4 and USAR Sections 10.4.7 and 9.2.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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 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 2.3.4.4-1 dated April 3, 2007, the staff stated that a license renewal drawing shows penetrations to the CST as excluded from the scope of license renewal. Additionally the staff noted that the CST shell is within the scope of license renewal. The staff requested that the applicant justify the exclusion of the tank penetrations from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the CST is a nonsafety-related component that is required for an SBO in accordance with 10 CFR 54.4(a)(3) and is highlighted as green on license renewal boundary drawing LR-WCGS-AD-M-12AP01. The applicant further explained that the penetrations for LT-0004, TE-0005, LSL-0010, low pressure N2 (nitrogen), and LSH-007 are also nonsafety-related but should be shown as green on this drawing to protect the integrity of the CST during an SBO. The applicant stated that the piping and components associated with these changes will be included within the scope of license renewal. However, because the component groups required in this change currently exist in the application, no changes are needed for LRA Tables 2.3.4-4 and 3.4.2-4.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.4-1 acceptable because it adequately explained that the CST components in question are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.4.4.-1 is resolved.

In RAI 2.3.4.4-2 dated April 3, 2007, the staff stated that a license renewal drawing shows vents and vacuum relief valves on the CST that are excluded from the scope of license renewal. Additionally, the staff noted that the tank shell is within the scope of license renewal. The staff requested that the applicant justify the exclusion of the vents from the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the CST is a nonsafety-related component that is required to support an SBO in accordance with 10 CFR 54.4(a)(3) and is highlighted in green on license renewal drawing LR-WCGS-AD-M-12AP01. The applicant explained that the tank vent lines and vacuum relief valves are also nonsafety-related. However, these components should be shown as green on this drawing to protect the integrity of the CST during an SBO. The applicant agreed that the piping and components associated with the tank vent lines and vacuum relief valves will be included within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.4-2 acceptable because it adequately explains that the CST components in question are within the scope of license renewal. Therefore, the staff's concern described in RAI 2.3.4.4-2 is resolved.

In RAI 2.3.4.4-3 dated April 3, 2007, the staff stated that a license renewal drawing shows external steam heating coils attached to the CST as excluded from the scope of license renewal. Additionally the staff noted that USAR Section 9.2.6.5 states that the nominal minimum temperature for the CST is 50°F. The staff requested that the applicant justify the exclusion of either the steam heating coils and/or the tank insulation from LRA Tables 2.3.4-4 and 3.4.4-4 as component types within the scope of license renewal.

In its response dated May 2, 2007, the applicant stated that the CST is a nonsafety-related component that is within the scope of license renewal to support SBO requirements based on the criteria of 10 CFR 54.4(a)(3). The applicant further explained that the CST is highlighted as green on license renewal boundary drawing LR-WCGS-AD-M-12AP01. Additionally, the applicant explained that the CST auxiliary steam heating components and its insulation are also nonsafety-related. The applicant also stated that although these components are mentioned in the USAR, the USAR does not state the components are required to remain functional during and following DBEs nor do they support SBO requirements. The applicant further identified that the WCGS technical specifications require a minimum of 281,000 gallons of water in the CST during normal operations and USAR Section 9.2.6.5 states that CST water be at least 50° F during normal operations. The applicant explained that the initial condition of 50° F water temperature is verified during normal plant operation.

The applicant concluded that the WCGS technical specifications required water volume is sufficient to assure mitigation of a DBE without associated nonsafety-related components and that the CST auxiliary steam heating and insulation have no intended functions and are not within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.4-3 acceptable because it adequately identified a basis for the exclusion of the CST auxiliary steam heating components and its insulation from the scope of license renewal by citing that the required minimum of 281,000 gallons of inventory along with temperature monitoring by technical specification surveillance would ensure that minimum temperature would be met. Therefore, the staff's concern described in RAI 2.3.4.4-3 is resolved.

2.3.4.4.3 Conclusion

The staff reviewed the LRA, USAR, drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the condensate 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).

2.3.4.5 Steam Generator Blowdown System

2.3.4.5.1 Summary of Technical Information in the Application

LRA Section 2.3.4.5 describes the steam generator blowdown system (SGBS), which isolates the steam generator to maintain a heat sink for safe shutdown. The SGBS also provides containment isolation for steam generator drain piping penetration P-78. The SGBS provides continuous blowdown of water from the lower portion of each steam generator secondary side to remove solids and chemical contaminates that accumulate in the steam generators during normal operations. The blowdown from each steam generator flows under pressure to a blowdown flash tank. The discharge from the flash tank flows to a series of heat exchangers where the temperature is reduced prior to processing of the effluent.

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

LRA Table 2.3.4-5 identifies SGBS component types within the scope of license renewal and subject to an AMR:

- closure bolting
- instrument bellows
- insulation
- piping
- pump
- strainer
- tank
- tubing
- valve

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

- heat loss control
- pressure boundary
- maintains mechanical and structural integrity to prevent spatial interactions that could cause failure of safety-related SSCs
- *maintains mechanical and structural integrity to provide structural support to attached* safety-related piping and components

2.3.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.5 and USAR 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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).

2.3.4.5.3 Conclusion

The staff reviewed the LRA, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the SGBS 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).

2.3.4.6 Auxiliary Feedwater System

2.3.4.6.1 Summary of Technical Information in the Application

LRA Section 2.3.4.6 describes the auxiliary feedwater system, which is relied upon as the source of feedwater supply to the steam generators during startup, cooldown, and emergency conditions to maintain a secondary heat sink for DBE mitigation. The auxiliary feedwater system takes feedwater from the CST through the auxiliary feedwater pumps that discharge to the feedwater system piping and steam generators. Auxiliary feedwater automatically transfers from the CST to the ESWS on low CST suction pressure to maintain a source of feedwater for decay heat removal. The CST is in the condensate storage and transfer system and included in condensate system evaluation in SER Section 2.3.4.4. Two motor-driven auxiliary feedwater pumps and one turbine-driven pump are available to ensure required feedwater flow to the steam generators. The steam turbine drive for the turbine-driven auxiliary feedwater pump is evaluated with the main steam system in SER Section 2.3.4.2.

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

LRA Table 2.3.4-6 identifies auxiliary feedwater system component types within the scope of license renewal and subject to an AMR:

- closure bolting
- filter
- heat exchanger shell side
- heat exchanger tube side
- orifice
- piping
- pump
- tubing
- turbine
- valve
- spacer ring

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

- flow restriction
- filtration
- heat transfer
- pressure boundary
- maintains mechanical and structural integrity to provide structural support to attached safety-related piping and components

2.3.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.4.6 and USAR Sections 10.4.9, 7.3.6, and 9.2.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to 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, USAR, and drawings to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the auxiliary feedwater 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).

2.4 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 the following structures:

- reactor building
- control building
- diesel generator building
- turbine building
- auxiliary building
- radwaste building
- emergency fuel oil tank access vaults
- ESW electrical duct banks and manways
- communications corridor
- transmission towers
- ESW access vaults
- fuel building
- ESW pumphouse
- circulating water screenhouse
- ultimate heat sink
- ESW discharge structure
- main dam and auxiliary spillway
- ESW valve house
- RWST foundation and valve house
- CST foundation and valve house
- concrete support structures for station transformers
- supports (structure)

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

The staff's evaluation of the information in the LRA was the same for all structures. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components and supporting structures for structures that appear to meet the license renewal scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived 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 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 USAR, for each structure to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated pursuant to 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions delineated pursuant to 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 Reactor Building

2.4.1.1 Summary of Technical Information in the Application

LRA Section 2.4.1 describes the reactor building, which limits the release of radioactive fission products following an accident to limit the dose to control room operators and the public. The reactor building physically supports itself, the RCS, ESFs, and other systems and equipment within the structure. The exterior walls and dome shelter and protect the reactor vessel and other safety-related SSCs from external events.

The reactor building is a seismic Category I structure housing the reactor, the RCS, the steam generators, and portions of the auxiliary and ESFs systems. The major structural components of the reactor building are the steel liner plate, penetrations, and reactor building internal structures.

The reactor building has safety-related components relied upon to remain functional during and following DBEs. In addition, the reactor building performs functions that support fire protection, ATWS, and SBO.

LRA Table 2.4-1 identifies reactor building component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals
- concrete elements
- electrical penetrations
- fire barrier coatings and wrappings
- fire barrier doors
- fire barrier seals
- hatch
- hatches/plugs
- containment liner
- refueling liner
- penetrations

- pipe whip restraints and jet shields
- stairs, platforms, and grates
- structural steel

The intended functions of the reactor building component types within the scope of license renewal include:

- shelter or protection for safety-related components
- rated fire barrier to confine or retard a fire from spreading
- flood protection barrier
- shielding against high-energy line breaks
- missile barrier
- thermal expansion and/or seismic separation
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components
- leak-tight barrier to protect public health and safety during DBEs
- pipe whip restraint
- shielding against radiation

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1 and USAR Sections 3.8.1, 3.8.2.1, 3.8.3.1, and 3.8.5.1.1 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4, "Scoping and Screening Results: Structures."

During its review, the staff evaluated the structural component functions described in the LRA and USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.1.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the reactor building 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 Control Building

2.4.2.1 Summary of Technical Information in the Application

LRA Section 2.4.2 describes the control building, which physically supports and protects the safety-related systems within it, and maintains a pressurized habitable environment for the operators during all postulated events. The control building is a rectangular, seven-story, structural steel and reinforced concrete structure housing the main control room, the computer, Class 1E switchgear, Class 1E battery rooms, access control data, cable spreading rooms, and portions of the main control room emergency ventilation systems. The control building shares a common base slab and a wall with the auxiliary building and is founded on undisturbed soil.

The control building has safety-related components relied upon to remain functional during and following DBEs. In addition, the control building performs functions that support fire protection, ATWS, and SBO.

LRA Table 2.4-2 identifies control building component types within the scope of license renewal and subject to an AMR:

- boot seals penetration
- caulking and sealant
- compressible joints and seals
- concrete block (masonry walls)
- concrete elements
- doors
- electrical penetrations
- fire barrier coatings and wraps
- fire barrier doors
- fire barrier seals
- instrument panels and racks
- mechanical penetrations
- roofing membrane
- stairs, platforms, and grates
- structural steel

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

- shelter or protection for safety-related components
- rated fire barrier to confine or retard a fire from spreading
- flood protection barrier
- missile barrier
- thermal expansion and/or seismic separation
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

- structural and/or functional support for safety-related components
- leak-tight barrier to protect public health and safety during DBEs

2.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2 and USAR Sections 3.8.4.1.3, 3.8.5, and 6.4.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.2.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the control 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).

2.4.3 Diesel Generator Building

2.4.3.1 Summary of Technical Information in the Application

LRA Section 2.4.3 describes the diesel generator building, which physically supports, shelters, and protects the diesel generators and its systems and components relied upon for the capability to shut down the reactor and maintain it in a safe shutdown condition. The diesel generator building is a seismic Category I, single-story, rectangular, structural steel and reinforced concrete structure housing the emergency diesel engines, fuel oil day tanks, exhaust silencers, and exhaust stacks.

The diesel generator building has safety-related components relied upon to remain functional during and following DBEs. In addition, the diesel generator building performs functions that support fire protection.

LRA Table 2.4-3 identifies diesel generator building component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals
- concrete elements
- doors
- electrical penetrations

- fire barrier coatings and wraps
- fire barrier seal
- hatches and plugs
- instrument panels and racks
- mechanical penetrations
- roofing membrane
- stairs, platforms, and grates
- structural steel

The intended functions of the diesel generator building component types within the scope of license renewal include:

- shelter or protection for safety-related components
- rated fire barrier to confine or retard a fire from spreading
- flood protection barrier
- missile barrier
- thermal expansion and/or seismic separation
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3 and USAR Sections 3.8.4.1.4, 3.8.4.4.3, and 3.8.5.1.4 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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 USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the diesel generator 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).

2.4.4 Turbine Building

2.4.4.1 Summary of Technical Information in the Application

LRA Section 2.4.4 describes the turbine building, which is designed to preclude gross collapse that could affect external safety-related structures or components under loads imposed by a design-basis tornado. Structural features protect safety-related components in other buildings from flooding by water from the turbine building. The turbine building is a rectangular, three-story, steel-framed structure enclosed with steel siding housing the turbine generator, condensers, and associated equipment.

The failure of nonsafety-related SSCs in the turbine building could prevent the satisfactory accomplishment of an safety-related function. The turbine building also performs functions that support fire protection and ATWS.

LRA Table 2.4-4 identifies turbine building component types within the scope of license renewal and subject to an AMR:

- compressible joints and seals
- concrete block (masonry walls)
- concrete elements
- fire barrier coatings and wraps
- fire barrier doors
- fire barrier seals
- instrument panels and racks
- metal siding
- penetration
- roofing membrane
- structural steel

The intended functions of the turbine building component types within the scope of license renewal include:

- shelter or protection for safety-related components
- rated fire barrier to confine or retard a fire from spreading
- flood protection barrier
- missile barrier
- thermal expansion and/or seismic separation
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

2.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.4.4 and USAR Sections 3.3.2.3 and 10.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.4.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the 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 Auxiliary Building

2.4.5.1 Summary of Technical Information in the Application

LRA Section 2.4.5 describes the auxiliary building, which supports, shelters, and protects ESFs and nuclear auxiliary systems equipment. In a safe shutdown, including the events of earthquake or post-fire accident that renders the control building uninhabitable and incapable of performing necessary functions, the auxiliary panel located in the auxiliary building ensures that the plant is able to reach a safe shutdown and maintain a safe condition. The auxiliary building is a multi-story structural steel and reinforced concrete seismic Category I structure housing the safety injection system, residual heat removal system, chemical and volume control monitoring system, auxiliary feedwater pumps, steam and feedwater isolation and relief valves, heat exchangers, other pumps, tanks, filters, and demineralizers, and heating and ventilating equipment.

The auxiliary building has safety-related components relied upon to remain functional during and following DBEs. In addition, the auxiliary building performs functions that support fire protection, ATWS, and SBO.

LRA Table 2.4-5 identifies auxiliary building component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals
- concrete block (masonry walls)
- concrete elements
- doors
- fire barrier coatings and wraps
- fire barrier doors
- fire barrier seals
- hatches and plugs

- penetration
- boot seal penetration
- electrical penetration
- mechanical penetration
- roofing membrane
- stairs, platforms, and grates
- structural steel

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

- shelter or protection for safety-related components
- rated fire barrier to confine or retard a fire from spreading
- flood protection barrier
- missile barrier
- thermal expansion and/or seismic separation
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support for safety-related components
- leak-tight barrier to protect public health and safety during DBEs
- shielding against radiation

2.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.4.5 and USAR Sections 3.8.4.1.1 and 3.8.5.1.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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 USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the auxiliary 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).

2.4.6 Radwaste Building

2.4.6.1 Summary of Technical Information in the Application

LRA Section 2.4.6 describes the radwaste building, which shelters and protects an automatic sprinkler system over the dry waste compactor and an automatic fire detection system. It also shelters and protects four switches required for post-fire safe-shutdown located in the radwaste control room. The switches and their cables run through the building, through the tunnel, and into the auxiliary building. The radwaste building is a rectangular, multi-story, structural steel and reinforced concrete structure housing radioactive waste treatment facilities, tanks, filters, and other miscellaneous equipment. The building extends below plant grade and is supported on a reinforced concrete mat foundation constructed on compacted earth fill. The building has a built-up roof supported by structural steel beams and girders. The roof and intermediate floor framing are supported by structural steel columns and reinforced concrete-bearing walls. The radwaste pipe tunnel is a below-grade, reinforced concrete, two-cell box structure connecting the auxiliary and radwaste buildings and separated from both buildings by isolation joints. The tunnel provides access and carries electrical cable trays and piping between the auxiliary building and the radwaste building.

The radwaste building performs functions that support fire protection.

LRA Table 2.4-6 identifies radwaste building component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- concrete block (masonry walls)
- concrete elements
- doors
- metal siding
- penetration
- roofing membrane
- structural steel
- tunnel

The intended functions of the radwaste building component types within the scope of license renewal include:

- shelter or protection for safety-related components
- structural support for nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

2.4.6.2 Staff Evaluation

The staff reviewed LRA Section 2.4.6 and USAR Section 3.8.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any

SCs with intended functions delineated pursuant to 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 USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the radwaste 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).

2.4.7 Emergency Fuel Oil Tank Access Vaults

2.4.7.1 Summary of Technical Information in the Application

LRA Section 2.4.7 describes the emergency fuel oil tank access vaults, which provide access to the emergency fuel oil storage tanks. The emergency fuel oil tank access vaults support, shelter, and protect components relied upon for the capability to shut down the reactor and maintain it in a safe shutdown condition. Also required to prevent nonsafety-related SSCs from hindering accomplishment of safety-related functions. The emergency fuel oil tank access vaults are seismic Category I, rectangular reinforced concrete vaults. The foundation is located 4 feet and 6 inches above each emergency fuel oil storage tank. The emergency fuel oil tank access vault floors are set on stabilized fill and have penetrations to allow for mechanical and electrical interface with the buried emergency fuel oil tank. The top slab is at grade and has a removable concrete cover. A manway provides access to each tank manhole, pump, discharge piping, conduits, level transmitter, and sample line. Buried pipe and electrical duct banks connect the emergency fuel oil storage tanks to the diesel generator building.

The emergency fuel oil tank access vaults have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related SSCs in the emergency fuel oil tank access vault could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.4-7 identifies emergency fuel oil tank access vault component types within the scope of license renewal and subject to an AMR:

- compressible joints and seals
- concrete elements
- duct banks and manholes
- hatches and plugs
- boot seal penetration

The intended functions of the emergency fuel oil tank access vaults component types within the scope of license renewal include:

- shelter or protection to safety-related components
- flood protection barrier
- structural and/or functional support to safety-related components

2.4.7.2 Staff Evaluation

The staff reviewed LRA Section 2.4.7 and USAR Sections 3.8.4.1.6 and 9.5.4.2.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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 USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the emergency fuel oil tank access vaults 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 Essential Service Water Electrical Duct Banks and Manways

2.4.8.1 Summary of Technical Information in the Application

LRA Section 2.4.8 describes the ESW electrical duct banks and manways, which protect electrical raceways required to operate the ESWS. The ESW removes heat from plant components requiring cooling for safe reactor shutdown. The ESWS also supplies emergency makeup to the fuel storage pool and CCWSs and is the backup water supply to the auxiliary feedwater system. The seismic Category I ESW electrical duct banks, located a minimum of 4 feet below grade, consist of numerous polyvinyl chloride (PVC) conduits encased in a reinforced concrete beam. These conduits house safety-related electrical cables. The ESW electrical duct banks exit the control building and traverse south and east to the ESW valve house and to the ESW pumphouse.

The ESW electrical duct banks and manways have safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.4-8 identifies ESW electrical duct banks and manways component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals

- concrete elements
- duct banks and manholes
- hatches and plugs
- structural steel

The intended functions of the ESW electrical duct banks and manways component types within the scope of license renewal include:

- shelter or protection to safety-related components
- missile barrier
- structural and/or functional support to safety-related components

2.4.8.2 Staff Evaluation

The staff reviewed LRA Section 2.4.8 and USAR Sections 3.8.4.1.11 and 3.8.5.1.8 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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 USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESW electrical duct banks and manways 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 Communications Corridor

2.4.9.1 Summary of Technical Information in the Application

LRA Section 2.4.9 describes the communications corridor, which is designed to preclude gross collapse that could affect safety-related structures or components under loads imposed by a design-basis tornado. Structural features protect safety-related components from flooding. The communications corridor is a steel-framed structure enclosed with steel siding, attached to the west side of the turbine building, separated from the north side of the control and auxiliary buildings by a 3-inch isolation gap, and supported by a reinforced concrete basemat founded on compacted soil. The communications corridor provides routing space for mechanical and electrical systems and access to adjacent buildings.

The failure of nonsafety-related SSCs in the communications corridor could prevent the satisfactory accomplishment of an safety-related function. The communications corridor also performs functions that support fire protection.

LRA Table 2.4-9 identifies communications corridor component types within the scope of license renewal and subject to an AMR:

- concrete block (masonry walls)
- concrete elements
- electrical penetrations
- fire barrier coatings and wraps
- fire barrier door
- fire barrier seal
- mechanical penetrations
- structural steel

The intended functions of the communications corridor component types within the scope of license renewal include:

- shelter or protection to safety-related components
- rated fire barrier to confine or retard a fire from spreading
- spray shield, curbs, or mechanical components for directing flow
- structural support for nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

2.4.9.2 Staff Evaluation

The staff reviewed LRA Section 2.4.9 and USAR Sections 3.3.2.3 and 3B.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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

The staff's review of LRA Section 2.4.9 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 2.4-1 dated April 10, 2007, the staff requested that the applicant identify the structural features which are used to protect safety-related components from flooding, and discuss whether they should be within the scope of license renewal.

In its response dated May 9, 2007, the applicant explained that the potential floodwater paths utilize curbs to preclude water from entering the safety-related areas. The curbs along the west side of the condenser pit and around the T-1 stairwell are provided to prevent water from spilling over into the safety-related spaces. The applicant stated that LRA Table 2.4-9 includes curbing, which is within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.4-1 acceptable because it has identified the structural features which are used to protect safety-related components from flooding, and stated that they were within the scope of license renewal. Therefore, the staff's concern described in RAI 2.4-1 is resolved.

2.4.9.3 Conclusion

The staff reviewed the LRA, USAR, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the communications corridor 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 Transmission Towers

2.4.10.1 Summary of Technical Information in the Application

LRA Section 2.4.10 describes the transmission towers, which support and suspend overhead transmission power lines connecting the station power block to the 345kV switchyard. The transmission tower structures support two independent and structurally separated overhead transmission power lines. The first transmission power line connects the main transformer to the 345kV switchyard and consists of two deadend structures, a steel transmission tower, and a wooden H-frame structure. The second transmission power line connects the 345kV switchyard to the start-up transformer and consists of two deadend structures, a steel transmission tower, and a wooden H-frame structure. Both lines run approximately 700 feet due north of the turbine building and make a right-angle turn into the 345kV switchyard.

The transmission towers perform functions that support SBO recovery.

LRA Table 2.4-10 identifies transmission towers component types within the scope of license renewal and subject to an AMR:

- concrete elements
- transmission tower

The intended function of the transmission towers component type within the scope of license renewal is structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions.

2.4.10.2 Staff Evaluation

The staff reviewed LRA Section 2.4.10 and USAR Section 8.2.1.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

The staff's review of LRA Section 2.4.10 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 2.4-2 dated April 10, 2007, the staff noted that LRA Section 2.4.10 states that there is a wooden H-frame structure within each of the two transmission power lines. However, the wooden H-frame structures are not listed in LRA Table 2.4-10 as a structure within the scope of license renewal. The staff requested that the applicant justify its exclusion from the scope of license renewal.

In its response dated May 9, 2007, the applicant stated that the wooden H-frame structure is included in LRA Table 2.4-10 within the component type transmission tower. The applicant also stated that LRA Table 3.5.2-10 includes line items for transmission towers made of carbon steel and treated wood.

Based on its review, the staff finds the applicant's response to RAI 2.4-2 acceptable because it clarifies that the wooden H-frame structure is within the scope of license renewal. Therefore, the staff's concern described in RAI 2.4-2 is resolved.

As a result of the onsite inspection performed by the staff during the weeks of September 10, and October 22, 2007, the applicant added the disconnects 13-21 and 13-23 within the scope of license renewal. By letter dated November 16, 2007, the applicant amended LRA Section 2.4.10 to state that the disconnects are housed in an electrical enclosure with a concrete foundation.

The staff finds this acceptable because it is consistent with the recommendations in the SRP-LR. The staff finds that this component is included within the component type of transmission tower and that it was inadvertently omitted from the scope of license renewal.

2.4.10.3 Conclusion

The staff reviewed the LRA, USAR, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the transmissions towers 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 Essential Service Water Access Vaults

2.4.11.1 Summary of Technical Information in the Application

LRA Section 2.4.11 describes the ESW access vaults, which provide access to portions of the underground ESW piping while protecting them from tornado-generated missiles. The ESW removes heat from plant components requiring cooling for safe reactor shutdown, supplies emergency makeup to the fuel storage pool and CCWSs, and is the backup water supply to the auxiliary feedwater system. The four ESW access vaults, which are independent from each other, are located below grade and provide for personnel and equipment access from the top.

The ESW access vaults have safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.4-11 identifies ESW access vaults component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals
- concrete elements
- hatches and plugs
- structural steel

The intended functions of the ESW access vaults component types within the scope of license renewal include:

- shelter or protection to safety-related components
- flood protection barrier
- missile barrier
- structural and/or functional support to safety-related components

2.4.11.2 Staff Evaluation

The staff reviewed LRA Section 2.4.11 and USAR Sections 3.8.4.1.14 and 3.8.5.1.11 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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 USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESW access vaults 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 Fuel Building

2.4.12.1 Summary of Technical Information in the Application

LRA Section 2.4.12 describes the fuel building, which supports, shelters, and protects SSCs for the handling and storage of spent fuel. The fuel building contains the spent fuel pool, transfer canal, cask loading pool and cask pit, spent fuel pool bridge crane, cask handling crane, and other miscellaneous equipment. The spent fuel pool receives spent fuel from the containment through the fuel transfer tube. The spent fuel pool, including the transfer canal, cask loading pool, and cask washdown pit, consist of reinforced concrete walls and floors lined with stainless steel plates. The concrete dividing walls and the spent fuel pool gates permit de-watering of the spent fuel pool without dewatering the entire pool.

The fuel building has safety-related components relied upon to remain functional during and following DBEs. In addition, the fuel building performs functions that support fire protection.

LRA Table 2.4-12 identifies fuel building component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals
- concrete elements
- doors
- electrical penetrations
- fire barrier coatings and wraps
- fire barrier doors
- fire barrier seals
- instrument panels racks
- mechanical penetrations
- roofing membrane
- spent fuel pool liner
- stairs and platforms and grates
- structural steel

The intended functions of the fuel building component types within the scope of license renewal include:

- shelter or protection to safety-related components

- rated fire barrier to confine or retard a fire from spreading
- missile barrier
- thermal expansion and/or seismic separation
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components
- leak-tight barrier to protect public health and safety during DBEs
- shielding against radiation

2.4.12.2 Staff Evaluation

The staff reviewed LRA Section 2.4.12 and USAR Sections 3.8.4.1.2 and 3.8.5.1.3 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.12.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the fuel 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).

2.4.13 Essential Service Water Pumphouse

2.4.13.1 Summary of Technical Information in the Application

LRA Section 2.4.13 describes the ESW pumphouse, which supports, shelters, and protects the ESW system. The ESW system removes heat from plant components requiring cooling for safe reactor shutdown, supplies emergency makeup to the fuel storage pool and CCWSs, and is the backup water supply to the auxiliary feedwater system. The seismic Category I ESW pumphouse is a tornado-resistant, rectangular, conventionally reinforced-concrete structure. Separate redundant operating floors and separate forebays support the ESW pumps and piping systems. The roof is constructed of a concrete slab with removable hatches. Tornado-resistant concrete missile shields protect ventilation system entrances and exits at roof elevation and the doors at grade. Structural steel commodities provide trash rack and stop log slots and guideways for the traveling water screens and walls.

The ESW pumphouse has safety-related components relied upon to remain functional during and following DBEs. In addition, the ESW pumphouse performs functions that support fire protection.

LRA Table 2.4-13 identifies ESW pumphouse component types within the scope of license renewal and subject to an AMR:

- boot seal penetration
- caulking and sealant
- compressible joints and seals
- concrete elements
- doors
- electrical penetrations
- hatches and plugs
- mechanical penetrations
- stairs, platforms, and grates
- structural steel

The intended functions of the ESW pumphouse component types within the scope of license renewal include:

- shelter or protection for safety-related components
- rated fire barrier to confine or retard a fire from spreading
- spray shield, curbs, or mechanical components for directing flow
- flood protection barrier
- missile barrier
- structural support for nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.4.13.2 Staff Evaluation

The staff reviewed LRA Section 2.4.13 and USAR Sections 3.8.4.1.8 and 3.8.5.1.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

The staff's review of LRA Section 2.4.13 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 2.4-3 dated April 10, 2007, the staff requested that the applicant clarify if the component type structural steel listed in LRA Table 2.4-13 include the trash rack and stop log slots, guideways for the traveling water screens, and walls. If not, the staff requested that the applicant provides a justification for their exclusion from the scope of license renewal.

In its response dated May 9, 2007, the applicant clarified that the trash rack and stop log slots, guideways for the traveling water screens, and walls are within the scope of license renewal. The applicant stated that LRA Table 2.4-13 includes the walls with the component type of concrete elements, and the trash rack, stop log slots, and guideways for the traveling screens and walls are within the component type of structural steel.

Based on its review, the staff finds the applicant's response to RAI 2.4-3 acceptable because it identifies the components in question within the scope of license renewal. Therefore, the staff's concern described in RAI 2.4-3 is resolved.

2.4.13.3 Conclusion

The staff reviewed the LRA, USAR, and the RAI response to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESW pumphouse 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).

2.4.14 Circulating Water Screenhouse

2.4.14.1 Summary of Technical Information in the Application

LRA Section 2.4.14 describes the circulating water screenhouse, which provides nonsafety-related structural support, shelter and protection for the motor-driven fire pump, diesel-driven fire pump, and jockey pump relied upon for the fire protection system. The duct banks and manholes shelter and protect the electrical cable supplying power to these fire protection components. The circulating water screenhouse, founded on compacted soil and rock, is a metal siding structure housing traveling screens, pumps and strainers for the service water system, the chlorinator room, circulating water pumps, and fire pumps. A fire wall separates the diesel-driven fire pump, its diesel oil fuel tank, and its controllers from the rest of the screenhouse. The electrical equipment room is also separated from the rest of the screenhouse by a fire wall. A series of duct banks and manholes provides a path for the electrical cable supplying power from the turbine building to the circulating water screenhouse. The site utilizes a large cooling lake as its source of circulating water and as its cooling mechanism. The circulating water screenhouse is on the east side of this lake.

The circulating water screenhouse performs functions that support fire protection.

LRA Table 2.4-14 identifies circulating water screenhouse component types within the scope of license renewal and subject to an AMR:

- compressible joints and seals
- concrete block (masonry walls)
- concrete elements
- doors
- duct banks and manholes
- electrical penetrations
- fire barrier coatings and wraps
- fire barrier doors
- fire barrier seals
- mechanical penetrations
- metal siding
- roofing membrane
- structural steel

The intended functions of the circulating water screenhouse component types within the scope of license renewal include:

- shelter or protection to safety-related components
- rated fire barrier to confine or retard a fire from spreading
- spray shield, curbs, or mechanical components for directing flow
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

2.4.14.2 Staff Evaluation

The staff reviewed LRA Section 2.4.14 and USAR Sections 2.4.1.1 and 9.5.1.2.2.1 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.14.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the circulating water screenhouse 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).

2.4.15 Ultimate Heat Sink

2.4.15.1 Summary of Technical Information in the Application

LRA Section 2.4.15 describes the UHS, which provides a reliable source of cooling water to the ESW system to dissipate the heat of DBEs safely and to achieve and maintain safe shutdown following a DBE. The UHS supplies emergency makeup water via the ESWS to the fuel storage pool and CCWSs, and is the backup water supply for the auxiliary feedwater system. The UHS consists of a normally submerged seismic Category I cooling pond (and no others). The UHS is formed by a 455 acre-feet volume with no sedimentation behind a seismic Category I earth-fill dam of predominantly clay soils in one finger of the main cooling lake approximately 1,700 feet in length and 18 feet in height above the Leavenworth Limestone foundation rock. The downstream slope was designed for instantaneous drawdown of the cooling lake. The rock slope protection for the UHS dam is designed for scour and embankment erosion potential during hypothetical main dam and baffle dike breaks.

The UHS has safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.4-15 shows dams and dikes as the UHS component types within the scope of license renewal and subject to an AMR.

The intended function of the UHS component types within the scope of license renewal is as a heat sink during SBOs or design-basis accidents.

2.4.15.2 Staff Evaluation

The staff reviewed LRA Section 2.4.15 and USAR Sections 2.5.6 and 9.2.5 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.15.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the UHS 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).

2.4.16 Essential Service Water Discharge Structure

2.4.16.1 Summary of Technical Information in the Application

LRA Section 2.4.16 describes the ESW discharge structure, which supports the ESWS discharge lines and provides the ESW discharge path into the UHS. The ESWS removes heat from plant components requiring cooling for safe reactor shutdown, supplies emergency makeup to the fuel storage pool and CCWSs, and is the backup water supply to the auxiliary feedwater system. The ESW discharge structure is a seismic Category I structure consisting of a 2-foot-thick reinforced concrete slab below grade in the UHS slope, ESW discharge structure wing walls, and an ESW discharge structure head wall.

The ESW discharge structure has safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.4-16 identifies ESW discharge structure component types within the scope of license renewal and subject to an AMR:

- concrete elements
- mechanical penetrations

The intended functions of the ESW discharge structure component types within the scope of license renewal include:

- shelter or protection to safety-related components
- spray shield, curbs, or mechanical components for directing flow
- structural and/or functional support to safety-related components

2.4.16.2 Staff Evaluation

The staff reviewed LRA Section 2.4.16 and USAR Sections 3.8.4.1.12, 3.8.4.4.8, and 3.8.5.1.9 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.16.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESW discharge structure

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).

2.4.17 Main Dam and Auxiliary Spillway

2.4.17.1 Summary of Technical Information in the Application

LRA Section 2.4.17 describes the main dam and auxiliary spillway required for the probable maximum flood. They protect safety-related structures during flooding DBEs. For cooling water required for the plant operation, a lake was created by constructing an earth dam (main dam) across the Wolf creek about 3 miles south of the plant. A service spillway and an auxiliary spillway, both lined with concrete, are on the east abutment of the main dam. The auxiliary (emergency) spillway is approximately 1500 feet east of the service spillway. The service spillway is required for all floods up to the 100-year flood. For floods greater than the 100-year flood up to the probable maximum flood, both the service and auxiliary spillways are required. The ability of the spillways to pass the probable maximum flood is the only function of the main dam within the scope of license renewal.

The failure of nonsafety-related SSCs in the main dam and auxiliary spillway could prevent the satisfactory accomplishment of an safety-related function.

LRA Table 2.4-17 identifies dams and dikes as the main dam and auxiliary spillway component types within the scope of license renewal and subject to an AMR.

The intended function of the main dam and auxiliary spillway component types within the scope of license renewal is as a flood protection barrier.

2.4.17.2 Staff Evaluation

The staff reviewed LRA Section 2.4.17 and USAR Sections 2.4.8.2.2 and 2.5.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.17.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the main dam and auxiliary spillway 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).

2.4.18 Essential Service Water Valve House

2.4.18.1 Summary of Technical Information in the Application

LRA Section 2.4.18 describes the ESW valve house, which provides access to portions of underground ESW piping and valves and shelters and protects the ESW components. The ESW removes heat from plant components requiring cooling for safe reactor shutdown, provides emergency makeup to the fuel storage pool and CCWSs, and is the backup water supply for the auxiliary feedwater system. The ESW valve house is a rectangular, reinforced concrete structure housing redundant ESW supply and discharge piping and valves. The valve house is located below grade, and provides for personnel and equipment access from the top.

The ESW valve house has safety-related components relied upon to remain functional during and following DBEs.

LRA Table 2.4-18 identifies ESW valve house component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- compressible joints and seals
- concrete elements
- hatches and plugs
- boot seal penetration
- mechanical penetrations
- structural steel

The intended functions of the ESW valve house component types within the scope of license renewal include:

- shelter or protection to safety-related components
- flood protection barrier
- missile barrier
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.4.18.2 Staff Evaluation

The staff reviewed LRA Section 2.4.18 and USAR Sections 3.8.4.1.10 and 3.8.5.1.7 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.18.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the ESW valve house 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).

2.4.19 Refueling Water Storage Tank Foundation and Valve House

2.4.19.1 Summary of Technical Information in the Application

LRA Section 2.4.19 describes the RWST foundation and valve house, which shelters and protects mechanical and electrical components. The duct banks shelter and protect the RWST electrical components. The 419,000-gallon RWST is supported on a reinforced concrete slab on backfilled and compacted grade. The RWST foundation scope includes the slab foundation, the integral sump, and the RWST valve house and its duct banks. The RWST piping is routed to the fuel building and radwaste tunnel.

The RWST foundation and valve house have safety-related components relied upon to remain functional during and following DBEs. In addition, the RWST foundation and valve house perform functions that support fire protection.

LRA Table 2.4-19 identifies the RWST foundation and valve house component types within the scope of license renewal and subject to an AMR:

- boot seal penetration
- caulking and sealant
- concrete elements
- doors
- duct banks and manholes
- electrical penetrations
- hatches and plugs
- mechanical penetrations
- roofing membrane
- structural steel

The intended functions of the RWST foundation and valve house component types within the scope of license renewal include:

- shelter or protection to safety-related components
- flood protection barrier
- structural and/or functional support to safety-related components

2.4.19.2 Staff Evaluation

The staff reviewed LRA Section 2.4.19 and USAR Sections 3.8.4.1.5 and 3.8.5.1.5 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.19.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the RWST foundation and valve house 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).

2.4.20 Condensate Storage Tank Foundation and Valve House

2.4.20.1 Summary of Technical Information in the Application

LRA Section 2.4.20 describes the CST foundation and valve house, which support the nonsafety-related CST. The CST pipe house and CST trench shelter and protect mechanical and electrical components. The 450,000-gallon CST is supported on a reinforced concrete slab on backfilled and compacted grade. The CST foundation includes the CST slab foundation, the integral sump, the CST pipe house, CST trench, ladders, grating, gates and handrails. The piping is routed through the CST trench to the turbine and auxiliary buildings.

The CST foundation and valve house perform functions that support fire protection and SBO.

LRA Table 2.4-20 identifies CST foundation and valve house component types within the scope of license renewal and subject to an AMR:

- compressible joints and seals
- concrete block (masonry walls)
- concrete elements
- doors

- hatches and plugs
- mechanical penetrations
- roofing membrane
- structural steel

The intended functions of the CST foundation and valve house component types within the scope of license renewal include:

- shelter or protection to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

2.4.20.2 Staff Evaluation

The staff reviewed LRA Section 2.4.20 and USAR Section 9.2.6 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.20.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the CST foundation and valve house 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).

2.4.21 Concrete Support Structures for Station Transformers

2.4.21.1 Summary of Technical Information in the Application

LRA Section 2.4.21 describes the concrete support structures for station transformers, which provide structural support of the ESF, startup, main, unit auxiliary, and station service station transformers and support equipment. The concrete support structures for station transformers (ESF, startup, main, unit auxiliary, and station service) are reinforced concrete pads founded on structural fill. The main and unit auxiliary transformers and support equipment are mounted on one common pad and are separated by concrete barrier walls. The two ESF transformers and support equipment are mounted on another common pad and are separated by a concrete barrier wall. The startup and station service transformers and support equipment are mounted on separate pads. Buried concrete duct banks connect the ESF transformers to the turbine building and to the switchyard. Manholes along these duct banks are for cable installation and access.

The concrete support structures for station transformers perform functions that support fire protection and SBO.

LRA Table 2.4-21 identifies concrete support structure for station transformer component types within the scope of license renewal and subject to an AMR:

- caulking and sealant
- concrete elements
- duct banks and manholes
- electrical penetrations
- structural steel

The intended functions of the concrete support structures for station transformers component types within the scope of license renewal include:

- shelter or protection to safety-related components
- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions

2.4.21.2 Staff Evaluation

The staff reviewed LRA Section 2.4.21 and USAR Section 8.1.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.21.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the concrete support structures for station transformers 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).

2.4.22 Supports

2.4.22.1 Summary of Technical Information in the Application

LRA Section 2.4.22 describes the supports, which are within the scope of license renewal because they support and protect components within the scope of license renewal. Supports are integral parts of all systems and many of these supports are not uniquely identified with component identification numbers. However, support characteristics such as design, materials of construction, environments, and anticipated stressors are similar. Therefore, structural supports for mechanical and electrical components are evaluated as commodities across system boundaries. The commodity evaluation applies to structural supports for structures within the scope of license renewal. The following structural supports for mechanical components are addressed: supports for ASME Class 1 piping and components, supports for ASME Classes 2 and 3 piping and components, and supports for HVAC ducts, tube track, instrument tubing, instruments, and non-ASME piping and components. The following electrical components and supports are addressed: cable trays and supports, conduit and supports, and electrical panels and enclosures. The following RCS component supports are included with the ASME Class 1 piping and component commodity group: reactor vessel supports, pressurizer supports, steam generators, and RCP supports.

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

LRA Table 2.4-22 identifies supports component types within the scope of license renewal and subject to an AMR:

- cable trays and supports
- conduit and supports
- electrical panels and enclosures
- high strength bolting
- spring hangers
- ASME 1 supports
- ASME 2 supports
- HVAC duct supports
- instrument supports
- mechanical equipment Class 1 supports
- mechanical equipment Class 2 and 3 supports
- mechanical equipment non-ASME supports
- non-ASME supports

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

- shelter or protection to safety-related components
- thermal expansion and/or seismic separation

- structural support to nonsafety-related components whose failure could prevent satisfactory accomplishment of required safety functions
- structural and/or functional support to safety-related components

2.4.22.2 Staff Evaluation

The staff reviewed LRA Section 2.4.22 and USAR Section 5.4.14.2 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 USAR to verify that the applicant has not omitted from the scope of license renewal any SCs with intended functions delineated pursuant to 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).

2.4.22.3 Conclusion

The staff reviewed the LRA and USAR to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any SCs subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the supports 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 I&C systems. Specifically, this section discusses the electrical component types.

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 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 USAR, 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 pursuant to 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions delineated pursuant to 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 Electrical Component Types

2.5.1.1 Summary of Technical Information in the Application

LRA Section 2.5 describes the electrical component types, which include:

- cable connections (metallic parts)
- connectors
- electrical penetrations
- high-voltage insulators
- insulated cables and connections
- switchyard bus and connections
- terminal blocks
- transmission conductors and connections
- electrical equipment subject to 10 CFR 50.49 EQ requirements
- fuse holders (not part of a larger assembly)
- grounding conductors
- metal enclosed bus

Cable connections (metallic parts), connectors, insulated cables and connections, the switchyard bus and connections, and terminal blocks electrically connect specified sections of an electrical circuit to deliver voltage, current, or signals. High-voltage insulators support and insulate the high-voltage transmission conductors and switchyard bus. Primary containment electrical penetrations perform the functions of primary containment boundary and electrical continuity. Transmission conductors and connectors supply offsite power to various plant systems. Electrical equipment subject to 10 CFR 50.49 EQ requirements is evaluated as a time-limited aging analysis and managed under the EQ program. All fuse holders, including the fuses installed for electrical penetration protection, are parts of larger assemblies and managed as parts of the active components. The uninsulated grounding conductors bond metal raceways, building structural steel, and plant equipment to earth ground through an installed grounding grid. The uninsulated grounding conductors are nonsafety-related and protect personnel and equipment. The grounding conductors do not prevent faults and are not required for equipment operation. Therefore, failure of a grounding conductor cannot affect the accomplishment of any safety functions. The enclosed electrical phase bus is not part of an active component like a switchgear, load center, or motor control center. The isolated phase bus is not within the scope of license renewal.

The failure of nonsafety-related SSCs in the electrical component types could prevent the satisfactory accomplishment of an safety-related function. The electrical component types also perform functions that support SBO.

LRA Table 2.5-1 identifies electrical component types within the scope of license renewal and subject to an AMR:

- cable connections (metallic part)
- connector
- electrical penetrations
- high-voltage insulator
- insulated cable and connections
- switchyard bus and connections
- terminal block
- transmission conductors and connections

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

- electrical continuity
- electrical insulation
- nonsafety-related support

2.5.1.2 Staff Evaluation

The staff reviewed LRA Section 2.5 using the evaluation methodology described in SER Section 2.5 and 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 USAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated pursuant to10 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 2.5 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 2.5-1 dated April 11, 2007, the staff noted that LRA Section 2.5 does not explicitly describe the offsite recovery paths (from the switchyard to the onsite distribution system) for an SBO. General Design Criteria 17 of 10 CFR Part 50, Appendix A, requires that electric power from the transmission network to the onsite electric distribution system be supplied by two physically independent circuits to minimize the likelihood of their simultaneous failure. In addition, the staff noted that the guidance provided by letter 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 SCs 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.

The staff clarified that both paths that are used to control the offsite circuits to the plant should be age managed. According to LRA drawing LR-WCGS-ELEC-KD-7496, the high-voltage switchyard circuit breakers, underground cables, and its associated components and structures are not presently included within the scope of license renewal. The staff requested that the applicant justify why these components are not within the scope of license renewal and explain in detail which high-voltage breakers and other components in the switchyard will be connected from the startup transformer XMR01 and ESF No. 1 transformer XNB01 up to the offsite power system for the purpose of SBO recovery.

In its response dated May 9, 2007, the applicant stated that the 345kV switchyard system equipment beyond disconnect 345-163 and the 13.8kV switchyard system equipment beyond disconnects 13-21 and 13-23 are not within the scope of license renewal because they are part of the transmission system grid and not part of the plant system portion.

During a telephone conference dated June 13, 2007, the staff informed the applicant that its response was unacceptable. The staff believes that the switchyard is part of the plant system and that the SBO recovery paths should be within the scope of license renewal in accordance with staff guidance dated April 1, 2002.

In its response dated August 8, 2007, the applicant stated that the WCGS scoping of SBO equipment for license renewal is consistent with the direction provided in the letter dated April 1, 2002. The applicant stated that the SBO boundary starts at the disconnects 345-163, 13-21 and 13-23, which are the preferred offsite power source and alternate offsite power connection points, respectively, and include disconnects, the offsite system power transformers (e.g., startup transformer), overhead and buried cables, station transformers, buses, and isolation breakers. Upstream of the disconnects are the 345 kV buses, switchyard components, and the incoming lines, all parts of the transmission (i.e., grid) system, not the plant system.

The staff informed the applicant that the WCGS position is not consistent with the staff guidance and; therefore, is unacceptable. As discussed during a public meeting between NRC and NEI, held on December 12, 2007, the staff believes that the offsite power recovery path, from two independent sources from the switchyard to the plant Class 1E safety buses, includes

(1) switchyard circuit breakers that connect to the offsite power system (i.e., grid), (2) power transformers, (3) intervening overhead or underground circuits (i.e., cables, buses and connections, transmission conductors and connections, insulators, disconnect switches, and associated components), (4) circuits between the circuit breakers and power transformers, (5) circuits between the power transformers and onsite electrical distribution system, and (6) the associated control circuits and structures. The staff evaluated the paths identified in the SBO coping duration calculation for recovering offsite power following an SBO event. The SSCs within the scope of the license renewal should include a circuit breaker at transmission voltage to ensure adequate protection of the safety buses (ensure recovery of offsite sources). The staff believes that the circuit breaker(s) needs to be within the scope of license renewal because of its ability to provide plant power, protect downstream circuits and provide plant operator-controlled isolation and energization ability. A circuit breaker can provide fault protection and prevent transients from affecting the onsite distribution system as offsite power is being restored. Therefore, the staff understands that at WCGS, the SBO recovery path that should be included within the scope of license renewal are circuits up to and including the switchyard circuit breakers. This was identified as open item (OI) 2.5-1.

By letter dated March 29, 2008, the applicant revised the SBO recovery paths to include circuitbreakers as the scoping boundary. The primary path from the safety buses, as described in LRA Section 2.1.2.3.5, is through startup transformer XMR01. The startup transformer is connected to the West Bus via disconnect switch 345-163 and the scoping boundary is circuit breaker 345-70, which connects the West Bus to the 345 kV Benton line. LRA Section 2.1.2.3.5 describes the second SBO recovery path, which is from the safety buses through ESF transformer No. 1 to disconnect switch 345-167, which connects to the East bus. The underground cable from disconnect switch 13-23 to circuit breaker 13-48 has been included within the scope of license renewal. The scoping boundary is circuit breaker 345-120, which connects the East Bus to the 345 kV La Cygne line. Thus, the change to the SBO recovery paths to include the complete path from the safety buses to circuit breakers at transmission voltage level resolves OI 2.5-1.

In RAI 2.5-2 dated April 11, 2007, the staff requested that the applicant clarify why elements such as resistance temperature detectors, sensors, thermocouples and transducers are not included in the list of components and/or commodity groups subject to an AMR if a pressure boundary is applicable.

In its response dated May 9, 2007, the applicant stated that the pressure boundary associated with resistance temperature detectors, sensors, thermocouples, and transducers are evaluated in mechanical systems as thermowells, flow indicators, and flow elements.

Based on its review, the staff finds the applicant's response to RAI 2.5-2 acceptable because it adequately included the components in question within the scope of license renewal. The applicant provided a list of the mechanical systems with thermowells, flow indicators, and flow elements within the scope of license renewal that are subject to an AMR. Therefore, the staff's concern described in RAI 2.5-2 is resolved.

In RAI 2.5-3 dated April 11, 2007, the staff noted that there has been operating experience regarding the failure of cable tie-wraps caused by the brittleness of the plastic material. The cable tie-wraps are long-lived passive components. Its intended functions include to maintain spacing for power cable ampacity, maintain stiffness in unsupported lengths of wire bundles to ensure minimum bending radius, and maintain cables within vertical raceways. The staff noted that most recently, at the Point Beach Nuclear Plant, the regional inspectors identified an unresolved item (as documented in RAI 2.5-3) after noticing that the current configuration of the plant may not be consistent with plant design documents due to age related breakage of a large number of plastic tie-wraps used to fasten wires and cables. At Point Beach, cable tie-wraps are part of the cable design in order to maintain cable ampacity or are credited in the licensee's Seismic Qualifications Utility Group documents to seismically qualify the cable tray system. Although Point Beach is a different power plant, the staff requested that the applicant explain how it manages the aging of cable tie-wraps and to justify why the cable tie-wraps are not included within the scope of license renewal.

In its response dated May 9, 2007, the applicant stated that:

> Cable tie wraps at the WCGS are not within the scope of license renewal and therefore, aging management is not required. Cable tie wraps perform no license renewal intended functions. The functions stated by the staff "maintain spacing for power cable ampacity, maintain stiffness in unsupported lengths of wire bundles to ensure minimum bending radius, and maintain cables within vertical raceways, among others" are not intended functions at the WCGS as defined by 10 CFR 54.4. WCGS has no CLB requirements that cable tie wraps remain functional during and following DBEs. Cable tie wraps provide no license renewal intended functions and do not meet any criteria found in 10 CFR 54.4(a)(1), (a)(2), or (a)(3).

During a telephone conference dated July 9, 2007, the staff stated that the applicant's response required clarification. The staff noted that there is operating experience showing instances in which degraded cable tie-wraps have failed and lodged in components preventing the performance of their intended functions. The staff requested that the applicant clarifies if WCGS considered the potential effect on safety-related equipment caused by the failure of plastic cable tie-wraps due to age-related degradation.

In its response dated August 9, 2007, the applicant stated that WCGS considered the potential effect on safety-related equipment caused by the failure of plastic cable tie-wraps due to age-related degradation and concluded that the failure of tie wraps that could prevent satisfactory accomplishment of the applicable functions of the SSCs identified pursuant to 10 CFR 54.4(a)(1) is not credible because:

- WCGS uses nylon tie wraps that are resistant to heat related aging. Nylon has a 60-year service environment of 119 °F. Most areas at WCGS have a maximum operating temperature of 104 °F with a few rooms with maximum operating temperature of 120 °F. No areas will see temperatures continuously above 119 °F for 60 years.

- WCGS uses "tefzel" tie wraps in radiation areas and within the containment. Tefzel has a 60-year service environment of 228 °F and 3 x 107 rads. The maximum operating temperature for the containment is 120 °F with a 60-year normal dose of 5.25 x 103 rads.

- Tie wraps are lightweight and nonconductive.

- Sensitive components that could be impacted by a loose tie wrap are installed within protective enclosures.

- WCGS has experienced no equipment failures due to tie wrap failures.

- WCGS employs good housekeeping and foreign material exclusion practices.

Based on its review, the staff finds the applicant's response to RAI 2.5-3 acceptable. The staff finds that WCGS considered the potential effect on safety-related equipment caused by the failure of plastic cable tie-wraps due to age-related degradation. The staff also finds that the tie wrap material at WCGS is appropriate for the environment (e.g., Tefzel in radiation areas), sensitive components are installed with protective enclosures, and that WCGS applies foreign material exclusion practices which would preclude tie wraps from entering sensitive areas. In addition, a review of operating experience did not demonstrate a failure affecting safety-related SSCs at WCGS. Therefore, the staff's concern described in RAI 2.5-3 is resolved.

2.5.1.3 Conclusion

The staff reviewed the LRA, USAR, and RAI responses to determine whether the applicant failed to identify any SSCs 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 that there is reasonable assurance that the applicant has adequately identified the electrical components within the scope of license renewal with the exception of the SBO recovery paths, 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, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review and Implementation Results," and determines that the applicant's scoping and screening methodology was consistent with 10 CFR 54.21(a)(1) and the staff's positions on the treatment of safety-related and nonsafety-related SSCs within the scope of license renewal and on SCs subject to an AMR is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

On the basis of its review, the staff concludes that the applicant has adequately identified those systems and components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

The staff concludes that there is reasonable assurance that the applicant will continue to conduct the activities authorized by the renewed license in accordance with the CLB and any changes to the CLB in order to comply with 10 CFR 54.21(a)(1), in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

SECTION 3

AGING MANAGEMENT REVIEW RESULTS

This section of the safety evaluation report (SER) evaluates aging management programs (AMPs) and aging management reviews (AMRs) for Wolf Creek Generating Station (WCGS) Unit 1, by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff). In Appendix B of its license renewal application (LRA), Wolf Creek Nuclear Operating Corporation (WCNOC or the applicant) described the 39 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 staff's 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 onsite audit of selected AMRs and associated AMPs during the weeks of March 26, and May 7, 2007. The onsite 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. 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 WCGS application is essentially the same. The intent of the revised format of the WCGS LRA was to modify the tables in LRA Section 3 to provide additional information that would assist in the staff's review. In its Table 1s, the applicant summarized the portions of the application that it considered to be consistent with the GALL Report. In its Table 2s, the applicant identified the linkage between the scoping and screening results in LRA Section 2 and the AMRs in LRA Section 3.

3.0.1.1 Overview of Table 1s

Each Table 1 compares in summary how the facility aligns with the corresponding tables in the GALL Report. The tables are essentially the same as Tables 1 through 6 in the GALL Report, except that the "Type" column has been replaced by an "Item Number" column and the "Item Number in GALL" column has been replaced by a "Discussion" column. The "Item Number" column is a means for the staff reviewer to cross-reference Table 2s with Table 1s. In the

"Discussion" column the applicant provided clarifying information. The following are examples of information that might be contained within this column:

- further evaluation recommended - information or reference to where that information is located
- The name of a plant-specific program
- exceptions to GALL Report assumptions
- discussion of how the line is consistent with the corresponding line item in the GALL Report when the consistency may not be obvious
- discussion of how the item is different from the corresponding line item in the GALL Report (e.g., when an exception is taken to a GALL AMP)

The format of each Table 1 allows the staff to align a specific row in the table with the corresponding GALL Report table row so that the consistency can be checked easily.

3.0.1.2 Overview of Table 2s

Each Table 2 provides the detailed results of the AMRs for components identified in LRA Section 2 as subject to an AMR. The LRA has a Table 2 for each of the systems or structures within a specific system grouping (e.g., reactor coolant 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 (ECCS). Each Table 2 consists of nine columns:

(1) Component Type – The first column lists LRA Section 2 component types subject to an AMR in alphabetical order.

(2) Intended Function – The second column identifies the license renewal intended functions, including abbreviations, where applicable, for the listed component types. Definitions and abbreviations of intended functions are in LRA Table 2.0-1.

(3) Material – The third column lists the particular construction material(s) for the component type.

(4) Environment – The fourth column lists the environments to which the component types are exposed. Internal and external service environments are indicated with a list of these environments in LRA Tables 3.0-1, 3.0-2, and 3.0-3.

(5) Aging Effect Requiring Management – The fifth column lists aging effects requiring management (AERMs). As part of the AMR process, the applicant determined any AERMs for each combination of material and environment.

(6) Aging Management Programs – The sixth column lists the AMPs that the applicant uses to manage the identified aging effects.

(7) NUREG-1801 Volume 2 Item – The seventh column lists the GALL Report item(s) identified in the LRA as similar to the AMR results. The applicant compares each combination of component type, material, environment, AERM, and AMP in LRA Table 2 with the GALL Report items. If there are no corresponding items in the GALL

Report, the applicant leaves the column blank in order to identify the AMR results in the LRA tables corresponding to the items in the GALL Report tables.

(8) Table 1 Item – The eighth column lists the corresponding summary item number from LRA Table 1. If the applicant identifies in each LRA Table 2 AMR results consistent with the GALL Report the Table 1 line item summary number should be listed in LRA Table 2. If there is no corresponding item in the GALL Report, column eight is left blank. In this manner, the information from the two tables can be correlated.

(9) Notes – The ninth column lists the corresponding notes used to identify how the information in each Table 2 aligns with the information in the GALL Report. The notes, identified by letters, were developed by an NEI work group and will be used in future LRAs. Any plant-specific notes identified by numbers provide additional information about the consistency of the line item with the GALL Report.

3.0.2 Staff's Review Process

The staff conducted three types of evaluations of the AMRs and AMPs:

(1) For items that the applicant stated were consistent with the GALL Report the staff conducted either an audit or a technical review to determine 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 effects of aging on SCs can be adequately managed to maintain their intended function(s) consistent with the plant's current licensing basis (CLB) for the period of extended operation, as required by 10 CFR Part 54.

3.0.2.1 Review of AMPs

For AMPs for which the applicant claimed consistency with the GALL AMPs, the staff conducted either an audit or a technical review to verify the claim. For each AMP with one or more deviations, the staff evaluated each deviation to determine whether the deviation was acceptable and whether the modified AMP would adequately manage the aging effect(s) for which it was credited. For AMPs not evaluated in the GALL Report, the staff performed a full review to determine their adequacy. The staff evaluated the AMPs against the following 10 program elements defined in SRP-LR Appendix A.

(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, "GALL Report Volume 2 Item," correlates to an AMR combination as identified in the GALL Report. The staff also conducted onsite audits to verify these correlations. A blank in column seven indicates that the applicant was unable to identify an appropriate correlation in the GALL Report. The staff also conducted a technical review of combinations not consistent with the GALL Report. The next column, "Table 1 Item," refers to a number indicating the correlating row in Table 1.

3.0.2.3 USAR Supplement

Consistent with the SRP-LR for the AMRs and AMPs that it reviewed, the staff also reviewed the updated safety analysis report (USAR) supplement, which summarizes the applicant's programs and activities for managing the effects of aging for the period of extended operation, as required by 10 CFR 54.21(d).

3.0.2.4 Documentation and Documents Reviewed

In its review, the staff used the LRA, LRA supplements, the SRP-LR, and the GALL Report.

During the onsite audit, the staff also examined the applicant's justifications to verify that the applicant's activities and programs will adequately manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant's license renewal project personnel and others with technical expertise relevant to aging management.

3.0.3 Aging Management Programs

SER Table 3.0.3-1, presents the AMPs credited by the applicant and described in LRA Appendix B. The table also indicates the SSCs that credit the AMPs and the GALL AMP with which the applicant claimed consistency and shows the section of this SER in which the staff's evaluation of the program is documented.

Table 3.0.3-1 WCGS Aging Management Programs

WCGS 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
ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	Existing	Consistent with exceptions	XI.M1	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems	3.0.3.2.1
Water Chemistry (B2.1.2)	Existing	Consistent with exception	XI.M2	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion system / containments, structures, and component supports	3.0.3.2.2
Reactor Head Closure Studs (B2.1.3)	Existing	Consistent with exceptions	XI.M3	reactor vessel, internals, and reactor coolant system	3.0.3.2.3
Boric Acid Corrosion (B2.1.4)	Existing	Consistent with enhancement	XI.M10	reactor vessel, internals, and reactor coolant system / engineered safety features / containments, structures, and component supports / electrical and instrumentation and controls	3.0.3.2.4
Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.5)	Existing	Consistent with enhancement	XI.M11A	reactor vessel, internals, and reactor coolant system	3.0.3.2.5
Flow-Accelerated Corrosion (B2.1.6)	Existing	Consistent with exception	XI.M17	reactor vessel, internals, and reactor coolant system / engineered safety features / steam and power conversion system	3.0.3.2.6
Bolting Integrity (B2.1.7)	Existing	Consistent with exceptions	XI.M18	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion system / containments, structures, and component supports	3.0.3.2.7

WCGS 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
Steam Generator Tube Integrity (B2.1.8)	Existing	Consistent with exception	XI.M19	reactor vessel, internals, and reactor coolant system	3.0.3.2.8
Open-Cycle Cooling Water System (B2.1.9)	Existing	Consistent	XI.M20	auxiliary systems	3.0.3.1.1
Closed-Cycle Cooling Water System (B2.1.10)	Existing	Consistent with exception and enhancement	XI.M21	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems	3.0.3.2.9
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	Existing	Consistent with enhancements	XI.M23	auxiliary systems	3.0.3.2.10
Fire Protection (B2.1.12)	Existing	Consistent with exception and enhancements	XI.M26	auxiliary systems / containments, structures, and component supports	3.0.3.2.11
Fire Water System (B2.1.13)	Existing	Consistent with exceptions	XI.M27	auxiliary systems	3.0.3.2.12
Fuel Oil Chemistry (B2.1.14)	Existing	Consistent with exceptions and enhancements	XI.M30	auxiliary systems	3.0.3.2.13
Reactor Vessel Surveillance (B2.1.15)	Existing	Consistent	XI.M31	reactor vessel, internals, and reactor coolant system	3.0.3.1.2
One-Time Inspection (B2.1.16)	New	Consistent	XI.M32	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion system	3.0.3.1.3
Selective Leaching of Materials (B2.1.17)	New	Consistent with exceptions	XI.M33	engineered safety features / auxiliary systems	3.0.3.2.14
Buried Piping and Tanks Inspection (B2.1.18)	New	Consistent	XI.M34	engineered safety features / auxiliary systems / steam and power conversion system	3.0.3.1.4
One-Time Inspection of ASME Code Class 1 Small-Bore Piping (B2.1.19)	Existing	Consistent with exception	XI.M35	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems	3.0.3.2.15

WCGS 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 (B2.1.20)	Existing	Consistent	XI.M36	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion system	3.0.3.1.5
Flux Thimble Tube Inspection (B2.1.21)	Existing	Consistent	XI.M37	reactor vessel, internals, and reactor coolant system	3.0.3.1.6
Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	New	Consistent	XI.M38	engineered safety features / auxiliary systems / steam and power conversion system	3.0.3.1.7
Lubricating Oil Analysis (B2.1.23)	Existing	Consistent with exception	XI.M39	reactor vessel, internals, and reactor coolant system / engineered safety features / auxiliary systems / steam and power conversion system	3.0.3.2.16
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.24)	New	Consistent	XI.E1	electrical and instrumentation and controls	3.0.3.1.8
Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.25)	Existing	Consistent	XI.E2	electrical and instrumentation and controls	3.0.3.1.9
Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.26)	New	Consistent	XI.E3	electrical and instrumentation and controls	3.0.3.1.10

WCGS 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
ASME Code Section XI, Subsection IWE (B2.1.27)	Existing	Consistent with exceptions	XI.S1	containments, structures, and component supports	3.0.3.2.17
ASME Code Section XI, Subsection IWL (B2.1.28)	Existing	Consistent with enhancement	XI.S2	containments, structures, and component supports	3.0.3.2.18
ASME Code Section XI, Subsection IWF (B2.1.29)	Existing	Consistent with exception	XI.S3	containments, structures, and component supports	3.0.3.2.19
10 CFR 50, Appendix J (B2.1.30)	Existing	Consistent	XI.S4	auxiliary systems / containments, structures, and component supports	3.0.3.1.11
Masonry Wall Program (B2.1.31)	Existing	Consistent with enhancement	XI.S5	containments, structures, and component supports	3.0.3.2.20
Structures Monitoring Program (B2.1.32)	Existing	Consistent with enhancements	XI.S6	auxiliary systems / containments, structures, and component supports	3.0.3.2.21
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Existing	Consistent with enhancements	XI.S7	containments, structures, and component supports	3.0.3.2.22
Nickel Alloy Aging Management Program (B2.1.34)	Existing	Plant-specific	N/A	reactor vessel, internals, and reactor coolant system / engineered safety features	3.0.3.3.1
Reactor Coolant System Supplement (B2.1.35)	New	Plant-specific	N/A	reactor coolant system	3.0.3.3.2
Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.36)	Existing	Consistent with enhancement	XI.E6	electrical and instrumentation and controls	3.0.3.2.23

WCGS 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
Metal Fatigue of Reactor Coolant Pressure Boundary (B3.1)	Existing	Consistent with enhancements	X.M1	reactor vessel, internals, and reactor coolant system	3.0.3.2.24
Environmental Qualification (EQ) of Electrical Components (B3.2)	Existing	Consistent	X.E1	electrical and instrumentation and controls	3.0.3.2.25
Concrete Containment Tendon Prestress (B3.3)	Existing	Consistent with enhancements	X.S1	containments, structures, and component supports	3.0.3.2.26

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:

- Open-Cycle Cooling Water System
- Reactor Vessel Surveillance
- One-Time Inspection
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring Program
- Flux Thimble Tube Inspection
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
- Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- 10 CFR 50, Appendix J

3.0.3.1.1 Open-Cycle Cooling Water System

Summary of Technical Information in the Application. LRA Section B2.1.9 describes the existing Open-Cycle Cooling Water System Program as consistent with GALL AMP XI.M20, "Open-Cycle Cooling Water System."

The Open-Cycle Cooling Water System Program manages loss of material and reduction of heat transfer for components exposed to raw water. The program includes chemical treatment and control of biofouling, heat exchanger performance testing, and periodic inspections. The program provides the general requirements for implementation and maintenance of programs and activities which mitigate aging of the open-cycle cooling water (OCCW) SSCs. The various aspects of the program (control, monitoring, maintenance, and inspections) are implemented in station procedures. Chemical treatment of OCCW systems inhibits corrosion, deposition, and fouling. A dispersant/anti-scalant is fed to the OCCW systems to prevent precipitation of scale-forming salts. A copper corrosion inhibitor inhibits the corrosion of copper and/or copper alloy system components. A nonoxidizing biocide controls macro-invertebrate (i.e., Asiatic Clam) infestation. Physical cleaning of the OCCW system components, including the intake bays, is also a macro-invertebrate control measure. Microbiological fouling is controlled by oxidizing and nonoxidizing biocide treatments. Periodic flushes on heat exchangers and piping in stagnant or low-flow areas of raw water systems remove silt and debris. Periodic visual examinations of OCCW system components detect conditions which initiate aging. Specific conditions to be documented include macro-invertebrate and microbiological fouling, scaling and deposition build-up, and the condition of component interior surfaces and coatings. Mechanical and/or chemical cleaning methods based on visual inspections remove deposits and fouling from heat exchangers and other components in OCCW systems. Physical cleaning of system components, including intake bays, also controls macro-invertebrate infestation. Physical cleaning may be coordinated with chemical control treatment for optimum results.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Open-Cycle Cooling Water System Program, as listed in the audit summary. Additionally, the staff reviewed the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M20.

The applicant's license renewal program evaluation report indicates that the Open-Cycle Cooling Water System Program relies on adherence to the commitments to Generic Letter (GL) 89-13 to manage age-related degradation in its open-cycle cooling water systems during the period of extended operation. The applicant's commitments made to the staff are principally implemented through the WCGS lake water systems corrosion and fouling mitigation program, the heat exchanger program, WCNOC procedure QCP-20-518, "Visual Examination of Heat Exchangers and Piping Components," and the lake water system structural integrity program. These programs and procedures perform the following activities on OCCW systems:

- biocides and corrosion inhibitors treatment
- periodic flushing and/or chemical cleaning to remove fouling
- periodic visual and/or nondestructive examination (NDE) inspection
- heat transfer testing in heat exchangers
- monitoring and trending of treatment, cleaning, and inspection results
- performs corrective actions through the plant's corrective action program

On the basis that the applicant adheres to the commitments to GL 89-13 as described above, the staff finds the Open-Cycle Cooling Water System Program follows the recommendations in the GALL Report.

Operating Experience. LRA Section B2.1.9 (appendix) states that WCGS has experienced macro-fouling (clam shells) of heat exchangers, room coolers, traveling screen spray nozzles, and such low-flow or stagnant piping portions as drain lines, dead legs, and standby trains. Macro-foul control methods include chemical treatment, system and component flushes, and inspection and cleaning. The result of the transition in biocide treatments from the original gaseous chloride through solid halogen donor in the 1993 to 1998 time frame to the current sodium bromide supplemented with nonoxidizing biocide (in anticipation of the appearance of Zebra mussels) is minimal evidence of clams at this time. The applicant stated that Zebra mussels have not been detected in the lake. Low-flow areas are flushed for biocide coverage and removal of silt and sedimentation. In addition, problems with the Train B auxiliary feedwater (AFW) pump room cooler were resolved by modification of the previous design of its 4-inch supply line, which caused susceptibility to clogging of the room cooler during quarterly supply header flushing. A plant modification moved the room cooler supply line from the bottom of the header to the top, thus preventing clogging of the line.

The applicant stated that in 2004, an increasing trend in tube leaks for OCCW room coolers with copper-nickel tubes led to an evaluation of the impact of the leaks and a review of maintenance and inspection practices. The review determined that a revised and a more conservative acceptance criteria could detect and remove degraded tubes from service prior to development of through-wall leaks.

The applicant describes that a report prepared in 2003 provided significant operating history for buried piping in many OCCW systems. The report refers to a 1996 observation that the overall condition of the piping was good with no significant internal corrosion and no systematic loss of wall thickness. WCGS piping systems have experienced corrosion, pitting, and sedimentation build-up especially in low-flow areas and stagnant dead legs off the main flow stream. Replacement of OCCW piping has been infrequent. Some small piping has been replaced because of blockage due to corrosion product build-up. These aging effects are controlled by flushing, chemical treatment, inspections, and cleaning. In 2005, two normally stagnant or low-flow sections of essential service water system (ESWS) piping were found to have pitting corrosion that required repair or replacement. These sections of piping include the ESWS "A" train warming line and auxiliary feed pump suction piping. The pitting corrosion of the ESWS "A" train warming line was caused by multiple factors. The pitted section of piping is located upstream of a vent previously used as an injection point for a chlorine solution used as a biocide. The applicant stated that the chlorine solution appeared to have been introduced to the warming line when there was no water flow. Chlorine gas absorbed into water forms hypochloric and hydrochloric acids, both corrosive to steel, with hydrochloric acid the stronger of the two. Chlorine gas is also highly corrosive to steel. Bubbles of chlorine gas apparently rose to the top of the pipe sections after injection, directly corroding the steel and forming acids along the top of the pipe. The applicant stated that chlorine is no longer used as a biocide.

The LRA states that another factor for pitting corrosion and wastage along the top piping quadrant is a water-air interface. Waterline attack is driven by the large difference in oxygen concentrations at the air-metal and water-metal interfaces. A section of ESWS "A" train auxiliary feed pump suction piping with through-wall leaks was cut out and visually examined. The applicant determined that the aging mechanism for the through-wall leak was pitting due to under-deposit corrosion typical for carbon steel piping exposed to raw water where small regions under tubercles develop into self-sustaining pits. The applicant stated that the aging did not compromise the structural integrity of the piping. The repair and replacements gained additional margin on the minimum wall thickness. Additional ultrasonic testing (UT) inspections of stagnant and low-flow areas of OCCW system piping are planned for the next refuel cycle. The applicant stated that stagnant and low-flow piping lines have such preventive maintenance as flushing and chemical treatment to mitigate such aging. However, due to the recent operating experience with pitting and under-deposit corrosion in these lines, study is on-going to improve the pressure boundary reliability of the OCCW systems. An overall project plan for OCCW piping remediation is under development.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Open-Cycle Cooling Water System Program. The staff also interviewed selected onsite personnel with specialized knowledge of the program. The staff reviewed selected instances previously documented by the applicant, that identified issues with the OCCW system and instances where the applicant implemented corrective actions.

The staff also reviewed the operating experience provided in the LRA to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. During review of the operating experience, the staff noted that the applicant, during a visual examination, discovered degradation that appeared to result from de-alloying in the emergency diesel generator (EDG) heat exchanger train "A" tubing that is made of copper alloy (i.e., C44300). Subsequent eddy current testing revealed multiple degradation indications. Metallurgical evaluation of the tubing did not show de-alloying. Most indications were identified as erosion-corrosion; however, one indication was a stress corrosion crack. The staff noted that stress corrosion cracking (SCC) of copper alloys is usually associated with ammonia or polluted waters. As a result, the staff requested that the applicant provides the details of augmented inspection, trending, and mitigation resulting from this incident.

In its response to the audit, the applicant stated that there was one axial crack in the EDG intercooler heat exchanger and that it was caused by stress corrosion. The exact initiation mechanism could not be established since the original inside diameter surface was lost due to flow-assisted corrosion. Ongoing corrective actions include preventive maintenance with eddy current test (ECT), analysis of the data, and corrective actions for any tubes that do not meet acceptance criteria. The applicant also stated that the EDG heat exchangers are being replaced with stainless steel tubing (i.e., AL6X) and that the intercooler heat exchangers were replaced during the refueling outage in 2006. The lube oil coolers and jacket water coolers are scheduled for replacement during the refueling outages in 2008 and 2011, respectively, or during a planned maintenance outage at power.

The staff noted that AL6X stainless steel is superior than copper alloys and is highly resistant to SCC, pitting, erosion corrosion, and crevice corrosion in raw water. The staff finds that the replacement of heat exchangers and coolers with copper tubing with heat exchangers and coolers with stainless steel tubing will provide improved resistance to erosion corrosion, pitting, crevice corrosion, and SCC.

During the audit, the staff noted that the problem identification reports indicated an increase in leakage trend in the electrical pen room cooler, the residual heat removal (RHR) pump "A" cooler, the centrifugal charging pump "A" room cooler, and the containment air "D" cooler. The staff requested that the applicant explain what caused the leaks and what actions are being taken to address the increased leak trend.

In its response, the applicant stated that about half of the room cooler leaks are the result of an isolated through-wall pit in the tubing. The remaining half of the leaks resulted from through-wall pitting combined with some flow erosion in the H-bend areas. The applicant clarified that tubes with deep through-wall pitting were allowed to remain in service because past eddy current testing acceptance criteria allowed it. The eddy current acceptance criteria was changed and past eddy current test data were reviewed to select room coolers for replacement. The RHR pump "A" cooler leak caused a lot of unavailability time and room coolers were declared a maintenance rule issue.

The applicant stated that corrective actions consist of replacing all degraded coolers. From a total of 16 room coolers, 11 have been replaced, three are scheduled for replacement by the refueling outage in 2008, and the remaining two are scheduled for replacement by the end of 2008. New cooler bundles are made of AL6XN tube material. Ongoing actions include preventive maintenance, ECTs, data analysis, and corrective actions for any tubes that do not meet acceptance criteria.

The applicant clarified that the failure mechanism of pitting and erosion for the containment air "D" cooler tubes and U-bends is assumed to be consistent with other copper nickel tube bundles in the room coolers because they have the same materials and same water source. The tube bundles are planned for replacement during the refueling outage in 2008. Future corrective actions will be based on the apparent cause because, given the configuration of these coolers, eddy current testing is not possible. Flow and pressure change and heat transfer capability are periodically verified in accordance with the WCGS commitments to GL 89-13. Any leakage is detected early by continuous monitoring of leak detection systems.

The staff noted that AL6XN stainless steel is superior to copper alloys and highly resistant to SCC, pitting, erosion corrosion, and crevice corrosion in raw water. Since the applicant is replacing room coolers with room coolers made of AL6XN stainless steel tubing, the staff finds that the applicant has addressed the degradation found during the inspection.

Based on its review, the staff finds that the actions taken by the applicant in response to the problem identification reports demonstrate the effectiveness of the plant's corrective action and the Open-Cycle Cooling Water System Programs.

The staff confirmed that the "operating experience" program element satisfies requirements defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.9, the applicant provided the USAR supplement for the Open-Cycle Cooling Water System Program. The staff reviewed this section and determines that the information in the USAR 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 Open-Cycle Cooling Water System 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Reactor Vessel Surveillance

Summary of Technical Information in the Application. LRA Section B2.1.15 describes the existing Reactor Vessel Surveillance Program as consistent with GALL AMP XI.M31, "Reactor Vessel Surveillance."

The Reactor Vessel Surveillance Program is consistent with American Society for Testing and Materials (ASTM) E 185. Actual reactor vessel coupons are used but an exemption in the original license permits use of material other than beltline weld for the weld coupons. The surveillance coupons are tested by an offsite vendor qualified to its procedures. The testing program and reporting comply with requirements of 10 CFR 50 Appendix H, "Reactor Vessel Material Surveillance Program Requirements." The schedule has been revised by removal of the last two coupon sets to the spent fuel pool at exposures greater than those expected at the beltline wall at 60 years. Therefore, this removal meets the ASTM E 185-82 criterion that capsules may be removed when its neutron fluence is between one and two times the limiting fluence calculated for the vessel at the end of expected life. Vessel fluence is now determined by ex-vessel dosimetry. This schedule change has been approved as required by 10 CFR 50 Appendix H.

Staff Evaluation. During its review, the staff evaluated the applicant's claim of consistency with GALL AMP XI.M31.

The staff noted that the applicant has removed and analyzed four reactor vessel surveillance capsules. The most recent capsule withdrawn, Capsule X, was determined to have a neutron fluence of 3.49×10^{19} n/cm^2 (i.e., E greater than 1 MeV, 54 effective full power years (EFPY)). All capsules were removed and tested to meet the test procedures and reporting requirements of ASTM E-185-82. The two remaining capsules have been placed in the spent fuel pool and are maintained for possible future reinsertion. Also, the calculations of reactor vessel embrittlement have been projected in accordance with Regulatory Guide (RG) 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials." The current applicable pressure-temperature (P-T) limits report is valid up to 20 EFPY and is not based on the evaluation of the most recently withdrawn Capsule X. The staff finds that the applicant will revise this report before reaching 20 EFPY and will project appropriate P-T limits to the end of the 60-year period as part of its CLB and required by the NRC regulations.

Section 50.61 of 10 CFR and 10 CFR Part 50, Appendix G, establish the requirements and criteria for generating the P-T limits for commercial light-water reactors in the United States. The P-T limit curves that apply for the current operating conditions are included in the facility's P-T limits report. The applicant's current P-T limits report is valid up to 20 EFPY. The data from the analysis of surveillance Capsule X are not included in the current P-T limits report.

By letter dated April 8, 2003, the applicant submitted its reactor pressure vessel (RPV) surveillance capsule report for Capsule X. By letter dated December 13, 2003, the staff concluded that there will not be any significant impact on P-T operating limits due to the Capsule X results. The applicant committed to revise the P-T limits report before reaching 20 EFPY and will at that time project appropriate P-T limits to the end of the 60-year licensed operating period. The P-T limit curves will be updated as required by 10 CFR Part 50, Appendix G, or by operational needs. The staff finds that this assures that the operational limits remain valid through the period of extended operation.

The staff reviewed the Reactor Vessel Surveillance Program for which the applicant claims the program to be consistent with GALL AMP XI.M31, and finds that it follows the recommendations provided in the GALL Report.

Operating Experience. LRA Section B2.1.15 states that the last tested capsule specimens were exposed to fluences equivalent to approximately 54 effective full-power years and demonstrated generous margins to the upper-shelf energy (USE) criterion, to pressurized thermal shock (PTS) temperature screening criteria, to low end-of-life adjusted reference temperatures, and to P-T limits in the limiting materials.

As part of the staff review of the operating experience, the staff noted that Capsule X was the fourth reactor pressure surveillance capsule withdrawn from WCGS on April 12, 2002. The neutron peak fluence was determined to be 3.49×10^{19} n/cm^2 (E greater than 1 MeV), equivalent to 60 years or 54 EFPY. The two remaining capsules have been transferred to the spent fuel pool.

The staff finds that this meets the ASTM E 185-82 criterion which states that capsules may be removed when the capsule neutron fluence is between one and two times the limiting fluence calculated for the vessel at the end of life. The staff's finds that the USE and PTS values in the limiting materials are acceptable.

Based on its review (observation of plant evolution), 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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.15, the applicant provided the USAR supplement for the Reactor Vessel Surveillance Program. The staff reviewed this section and determines that the information in the USAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's Reactor Vessel Surveillance 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 One-Time Inspection

Summary of Technical Information in the Application. LRA Section B2.1.16 describes the One-Time Inspection Program as consistent with GALL AMP XI.M32, "One-Time Inspection."

This program conducts one-time inspections of plant system piping and components to verify the effectiveness of the Water Chemistry, Fuel Oil Chemistry, and Lubricating Oil Analysis Programs. The aging effects to be evaluated by the One-Time Inspection Program are loss of material, cracking, and reduction of heat transfer. The One-Time Inspection Program specifies corrective actions and increased sampling of components if inspections find aging effects that lead to loss of component intended function. The inspections required by this program will be implemented and completed within ten years prior to the period of extended operation. In this time period the One-Time Inspection Program will assure manifestation of potential aging effects based on at least 30 years of WCGS operation. Major elements of the One-Time Inspection Program include identification of component populations subject to one-time inspection based on common materials and environments; determination of sample size by the method described in Electric Power Research Institute (EPRI) Report TR-107514 based on the population size of the material-environment groups; selection of components within such groups for inspection based on specified criteria like service period, operating conditions, and design margins; conducting American Society of Mechanical Engineers (ASME) Code Section XI NDE inspections of the selected components within the sample; and evaluating inspection results and initiating corrective action for unacceptable results to maintain component intended function.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the One-Time Inspection Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M32.

As a result of the onsite inspection performed by the staff during the weeks of September 10, and October 22, 2007, the applicant deleted the reference to EPRI TR-107514 from the program description. By letter dated November 16, 2007, the applicant amended LRA Section B2.1.16. As documented in the inspection report dated December 05, 2007, the staff noted that the sample size used by the applicant will be based on a 90 percent confidence that 90 percent of the material and environment population is not experiencing significant aging effects. The staff noted that the applicant made reference to EPRI TR-107514 because it discusses this sampling plan; however, the staff confirmed that the applicant will not apply the assumptions and analyses described by EPRI. Therefore, the staff finds acceptable the deletion of this reference since the AMP continues to be consistent with the recommendations of the GALL Report.

The staff finds that the applicant's One-Time Inspection Program provides reasonable assurance that the aging effects of loss of materials, cracking, and reduction of heat transfer will be adequately managed. The staff finds the applicant's One-Time Inspection Program acceptable because, when implemented, it will conform to the recommendations of the GALL Report.

Operating Experience. LRA Section B2.1.16 states that there is no programmatic operating experience for the new One-Time Inspection Program.

In LRA Section B2.1.16, the applicant explained that the One-Time Inspection Program is a new program to be implemented before the current operating license expires. The NDE inspection methods that will be used, such as visual (or remote visual), surface or volumetric, or other established techniques, are consistent with industry practice.

During the audit, the staff interviewed the applicant's technical personnel to confirm that plant-specific operating experience did not reveal degradation not bounded by industry experience. On this basis, the staff finds that performing a one-time inspection is an acceptable method for confirming that existing programs adequately manage potential aging effects. The staff recognizes that the applicant's corrective action program, which records internal and external plant operating experience, ensures continued review of operating experience. The implementation of the corrective action program also ensures that appropriate changes to the plant's program will be made, if deemed necessary. On the basis of its review of industry operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's One-Time Inspection 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 the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.16, the applicant provided the USAR supplement for the One-Time Inspection Program. The applicant committed (Commitment No. 7) to implement the One-Time Inspection Program described in LRA Section B2.1.16 within ten years prior to the period of extended operation. By letter dated November 16, 2007, the applicant deleted the reference to EPRI TR-107514 from the program description. The staff reviewed this section and determines that the information in the USAR 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 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 Buried Piping and Tanks Inspection

Summary of Technical Information in the Application. LRA Section B2.1.18 describes the new Buried Piping and Tanks Inspection Program as consistent with GALL AMP XI.M34, "Buried Piping and Tanks Inspection."

The Buried Piping and Tanks Inspection Program manages loss of material of buried components in the emergency service water (ESW), emergency diesel engine fuel oil storage and transfer, AFW, high-pressure coolant injection (HPCI (borated refueling water storage)), and the fire protection systems. Opportunistic visual inspections monitor the conditions of protective coatings and wrappings on carbon steel, gray cast iron, or ductile iron components, and assess the conditions of stainless steel components with no protective coatings or wraps. Evidence of damaged wrapping or defective coating is an indicator of possible corrosion damage to the external surface of the components.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Buried Piping and Tanks Inspection Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M34.

During the audit, the staff requested that the applicant clarify which materials are included in the Buried Piping and Tanks Inspection Program. Also, the staff requested that the applicant clarify which materials are not coated. If there are coated materials, the staff requested that the applicant describe these coatings.

In its response, the applicant stated that the materials included in the Buried Piping and Tanks Inspection Program include steel, stainless steel, ductile iron, and gray cast iron. The applicant clarified that coatings are not used on stainless steel materials. However, the steel, ductile iron and gray cast iron piping is coated with coal tar enamel, and steel tanks are coated with coal tar epoxy.

The staff finds that not using coatings in stainless steel piping is acceptable because this type of piping is not usually coated when it is used in soil. Stainless steel piping that is in contact with soil is not susceptible to aging effects. The staff finds that the use of coal tar enamel on piping and the use of coal tar epoxy on tanks is acceptable because both of these coating systems are commonly used for steel, ductile iron, and gray cast iron components that are in contact with soil.

During the audit, the staff requested that the applicant identify if WCGS has buried tanks. In its response, the applicant stated that the emergency fuel oil storage tanks are the only tanks monitored by the Buried Piping and Tanks Inspection Program. The applicant clarified that these storage tanks are made of carbon steel. The staff finds this acceptable because it is consistent with accepted industry practices which are endorsed by NRC.

The staff reviewed the Buried Piping and Tanks Inspection Program for which the applicant claims consistency with GALL AMP XI.M34 and finds that it follows the recommendations provided in the GALL Report.

Operating Experience. LRA Section B2.1.18 states that the Buried Piping and Tanks Inspection Program is a new program. However, there is operating experience with buried piping at WCGS. The applicant stated that in 1987, corrosion was discovered on multiple runs of buried piping within the scope of license renewal in the fire protection and AFW systems. The corrosion discovered in the fire protection system piping was on carbon steel piping directly connected to ductile iron piping. The study postulated that the AFW system corrosion was due to current straying (not protected) from the fuel oil system or galvanic due to the carbon steel piping acting as a sacrificial anode. The LRA states that since the completion of the 1987 study, there have been four occurrences of leakage due to corrosion of the external surface of buried components. Three occurred in buried portions of the service water system not within the scope of license renewal. An additional leak was discovered in the fire protection system in 1997. Subsequent excavation discovered loss of material due to pitting corrosion caused by a break in the protective coating.

During its review of the plant operating experience, the staff noted that in 1987, the engineering study for galvanic corrosion on underground piping at WCGS discovered corrosion on multiple runs of buried piping in the fire protection system that are within the scope of license renewal. The corrosion was characterized as galvanic corrosion. The fire protection system had four recorded discoveries of pitting corrosion, with two of these resulting in leakage. These sections of piping were replaced and recoated. Pitting was also found on carbon steel piping that was directly connected to ductile iron piping.

As a part of the staff review of operating experience, the staff noted that the study also discovered corrosion in the AFW system. It postulated that the corrosion in the AFW system was either due to stray current from the fuel oil system or galvanic corrosion due to the carbon steel piping becoming a sacrificial anode. This piping was repaired or replaced.

In addition, there were four occurrences of leakage due to corrosion of the external surface of buried components at WCGS. Three of these leaks occurred in buried portions of the non-ESWS, which are not within the scope of license renewal. An additional leak was discovered 1997 in the fire protection system outside the DG building. Subsequent excavation in 1998 discovered loss of material due to pitting corrosion caused by a break in the protective coating.

The staff finds that the borated refueling water and the AFW systems have only short runs of pipe between the pipe tunnels and the buildings. The 1987 engineering study provides the only known documentation of corrosion related failure in the AFW system. In this case, pitting corrosion was discovered on excavated carbon steel piping. This section of piping was then replaced from the condensate storage tank (CST) to the power block. There are no documented external corrosion related failures of the borated refueling water system.

The staff finds that the emergency fuel oil system has only short runs of pipe between the below grade fuel oil storage tank and the DG building. There are no documented external corrosion related failures of the emergency fuel oil system piping. Also, the ESWS has multiple long runs of carbon steel piping. There are no documented external aging failures of the buried ESWS piping.

The staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated to provide objective evidence to support the conclusion that the aging effects are adequately managed.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.18, the applicant provided the USAR supplement for the Buried Piping and Tanks Inspection Program. The applicant committed (Commitment No. 9) to implement the Buried Piping and Tanks Inspection Program described in LRA Section B2.1.18 prior to the period of extended operation. The staff reviewed this section and determines that the information in the USAR 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 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 External Surfaces Monitoring Program

Summary of Technical Information in the Application. LRA Section B2.1.20 describes the existing External Surfaces Monitoring Program as consistent with GALL AMP XI.M36, "External Surfaces Monitoring."

The External Surfaces Monitoring Program manages loss of material from external surfaces of steel components and hardening and loss of strength of elastomers in ventilation and mechanical systems. The program consists of periodic visual inspections during system engineer walkdowns to detect aging effects for aging management of loss of material, leakage, elastomer hardening and loss of strength. The scope of the program includes those systems and components requiring external surface monitoring. Walkdowns for systems inside containment are at least at every refueling outage or as necessary based on system safety significance, accessibility, production significance, trending of inspection results, and operating experience. Components inaccessible during both plant operations and refueling outages are evaluated for whether they have been or will be inspected at frequencies to ensure that aging effects are managed to maintain intended functions during the period of extended operation.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the External Surfaces Monitoring Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M36.

The staff reviewed the External Surfaces Monitoring Program for which the applicant claims consistency with GALL AMP XI.M36 and finds that it follows the recommendations provided in the GALL Report.

Operating Experience. LRA Section B2.1.20 states that external surfaces inspections via system inspections and walkdowns have been in effect at WCGS in support of 10 CFR 50.65 and have proven effective in maintaining the material condition of plant systems. The applicant stated that elements that comprise these inspections are consistent with industry practice.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's External Surfaces Monitoring Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed selected instances previously documented by the applicant that identified issues with external surfaces and where the applicant had implemented corrective action.

During the audit, the staff reviewed a sampling of the applicant's completed walkdown forms to assess how the data collected during the system walkdowns were documented, evaluated and added to the corrective action program. The staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated to provide objective evidence to support the conclusion that the aging effects are adequately managed.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.20, the applicant provided the USAR supplement for the External Surfaces Monitoring Program. The staff reviewed this section and determines that the information in the USAR 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 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 Flux Thimble Tube Inspection

Summary of Technical Information in the Application. LRA Section B2.1.21 describes the existing Flux Thimble Tube Inspection Program as consistent with GALL AMP XI.M37, "Flux Thimble Tube Inspection."

The Flux Thimble Tube Inspection Program performs wall thickness eddy current testing of all flux thimble tubes forming parts of the reactor coolant system (RCS) pressure boundary, which includes the length of the tube inside the reactor out to the seal fittings outside the reactor vessel. Eddy current testing is performed on the portion of the tubes inside the reactor vessel. The program implements the recommendations of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors." All flux thimble tubes are inspected during each refueling outage. Wall thickness measurements are trended and wear rates are calculated. If the predicted wear for a given flux thimble tube is projected to exceed the established acceptance criterion prior to the next refueling outage, corrective actions are taken to reposition, cap, or replace the tube. Program documentation maintains details of the core location, wear location, and the number of times a tube has been repositioned or replaced.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Flux Thimble Tube Inspection Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M37.

The GALL Report "scope of the program" program element refers to the applicant's responses to NRC Bulletin 88-09 and any amendments to those responses. The "acceptance criteria" program element states that acceptance criteria different from those previously documented in NRC acceptance letters for the responses to NRC Bulletin 88-09 should be justified.

During the audit, the staff reviewed the applicant's original response to NRC Bulletin 88-09 and its implementation procedure for the Flux Thimble Tube Inspection Program. The staff noted that the applicant's original response to NRC Bulletin 88-09 states that any flux thimble with a wall thickness loss of 60 percent or more would be removed from service. However, the applicant's implementation procedure states that any flux thimble with greater than 80 percent through-wall or projected to be greater than 80 percent before the next outage shall be removed from service by capping or an equivalent action.

For clarification purpose, the staff requested that the applicant (1) explain if WCGS had submitted any amendments to its original response to NRC Bulletin 88-09, (2) discuss the technical bases for the change from 60 percent to 80 percent through-wall wear as the criterion for removing a flux thimble tube from service, and (3) address whether the 80 percent acceptance criterion includes allowances for uncertainties as described in the GALL Report.

In its response, the applicant stated that NRC Bulletin 88-09 does not require that subsequent changes to the Flux Thimble Tube Inspection Program be submitted for NRC review, and no amendments to its original response to NRC Bulletin 88-09 have been submitted. The applicant also stated:

> WCAP [Westinghouse Commercial Atomic Power] -12866, 'Bottom Mounted Instrumentation Flux Thimble Wear,' was used to justify the change from 60 percent to 80 percent through-wall wear criterion at Wolf Creek for removing flux thimble tubes from service. Appendix A of WCAP-12866 provides the results of pressure testing and a finite element analysis and determined the maximum allowable wall loss. Based on the Westinghouse test results [in WCAP-12866], it was conservatively determined that a flux thimble can remain in service with up to 80 percent through-wall loss. The 80 percent through-wall loss acceptance criterion will maintain the structural and functional integrity of the flux thimble tubes, and the flux thimble tubes can remain in service up to 80 percent wall loss. It is noted that Wolf Creek procedures also address corrective actions at 60 percent indicated wall loss to prevent further through-wall loss by wear.

The staff reviewed the applicant's response and the detailed test data and evaluations provided in Westinghouse Commercial Atomic Power (WCAP)-12866. In WCAP-12886, Westinghouse compiled plant-specific wear rate data from Westinghouse-designed thimble tubes on behalf of participating members in the Westinghouse Owner's Group. Westinghouse used its generic compilation of thimble tube wear data to derive a generic wear rate equation for Westinghouse-designed thimble tubes.

The staff reviewed the WCGS implementing procedure for projecting flux thimble tube wear and finds that the implementing procedure requires that plant-specific eddy current test data be used for projecting wear. The following projecting wear methods are used: (1) linear extrapolation from zero wear, (2) linear extrapolation from the most recent eddy current test data, and (3) extrapolation using plant-specific data with the extrapolation method recommended in the WCAP's. The staff finds that the most limiting wear projected by these three methods is used to determine when corrective actions are necessary.

Based on its review, the staff concludes that the applicant's methodology for projecting flux thimble tube wear is adequate because it is based on plant-specific data and a conservative methodology for projecting wear. The staff also finds that the 80 percent through-wall loss acceptance criterion is adequate because it includes appropriate conservatism to ensure that structural and functional integrity of the flux thimble tubes will be maintained.

On this basis, the staff concludes that the applicant has an adequate technical justification for the change in the acceptance criterion from what was documented in the applicant's response to NRC Bulletin 88-09, and that the applicant's use of an 80 percent through-wall loss criterion for removing a thimble tube from service by capping or equivalent is acceptable.

The GALL Report "monitoring and trending" program element states that examination frequency will be based upon wear predictions that have been technically justified as providing conservative estimates of flux thimble tube wear. It also states that the interval between inspections will be established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection.

During the audit, the staff noted that the Flux Thimble Tube Inspection Program description in the LRA states "all flux thimble tubes are inspected during each outage." However, the applicant's implementing procedure includes a step that states "record the refueling at which eddy current testing will next be required, this will be one refueling before the wear reaches 60 percent through-wall for the thimble with the greatest projected wear."

The staff requested that the applicant clarify whether the frequency for eddy current testing of the flux thimble tubes is conditional (i.e., based on projected wear) or whether it is performed at each outage, as stated in the LRA. The staff also requested that the applicant provides technical justification that the methodology used for projecting flux thimble tube wear for future operating cycles is conservative.

In its response, the applicant stated:

> The Wolf Creek Flux Thimble Tube Inspection Program performs eddy current testing that is conditional (i.e., based on predicted wear). The Flux Thimble Tube Inspection Program calculates predicted wear based on WCGS' plant-specific data and verifies that wear is acceptable for the next two subsequent refueling outages. The refueling outage at which eddy current testing will be required is determined and will be one refueling before the wear reaches 60 percent through-wall for the thimble with the greatest projected wear. Wear trending of thimble tubes is documented as well as projected wear at the next cycle. Any thimble with wear in an active location greater than 60 percent through-wall or projected to be greater than 60 percent through-wall before the next outage should be repositioned. Any thimbles with greater than 80 percent through-wall

or projected to be greater than 80 percent through-wall before the next outage are capped, or equivalent, and considered for future replacement.

Based on the Westinghouse tests [as documented in WCAP-12866], eddy current data over-estimates the depth of actual wear scars. Using eddy current thimble wear data to predict wear will result in very conservative predictions of wall loss. Although the WCAP states that it is not necessary to add additional uncertainty margin to the eddy current wall loss indications, Wolf Creek uses an uncertainty margin of 5 percent for conservatism. Conservatism of the methodology for projecting wear for the following cycles is confirmed by WCAP test data that exhibits an exponentially decreasing curve of flux thimble wall loss versus operating time.

The applicant also stated that LRA Sections B2.1.21 and A1.21 will be amended to state "*During each outage, flux thimble tube wear is evaluated and inspections performed based on evaluation results.*"

The staff reviewed the applicant's response and its methodology for projecting flux thimble tube wear. The staff finds that the applicant's method for determining when to perform eddy current testing of the flux thimble tubes is based on plant-specific wear projections, which is consistent with the recommendations in the GALL Report.

Based on its review, the staff concludes that the applicant's methodology for determining when to perform eddy current examinations is adequate to ensure that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection. The staff determines that the applicant's conditional methodology for determining flux tube thimble examination frequency is consistent with the recommendations in the GALL Report.

By letter dated August 31, 2007, the applicant adequately amended LRA Sections A1.21 and B2.1.21 to include this change. The staff finds this acceptable because the amended LRA provides an accurate description of the Flux Thimble Tube Inspection Program as implemented in the applicant's procedures.

The staff reviewed the Flux Thimble Tube Inspection Program for which the applicant claims consistency with GALL AMP XI.M37 and finds that it follows the recommendations provided in the GALL Report.

Operating Experience. LRA Section B2.1.21 states that WCGS has inspected flux thimble tubes in accordance with NRC Bulletin 88-09, "Thimble Tube Wearing in Westinghouse Reactors." Details of the core location, wear location, and the number of times a tube has been repositioned, capped, or replaced are maintained. The applicant states that prior to 2002, no thimble tubes were replaced. Since that time, 11 flux thimble tubes were replaced, ten due to wear, with more wear-resistant chrome-plated tubes. There have been no through-wall failures of flux thimble tubes causing a loss of reactor coolant pressure boundary (RCPB).

During the audit, the staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff requested that the applicant: (1) provide records of flux thimble tube inspections, (2) provide additional discussion of site-specific operating experience with the Flux Thimble Tube Inspection Program, and (3) explain why 10 of 11 flux thimble tubes were replaced with a more wear-resistant design, but the eleventh replacement did not use a more wear-resistant design.

In its response, the applicant stated:

> The first flux thimble tube inspection using eddy current testing with recorded wear results was performed during refueling outage 4, spring 1990. Eddy current testing has been performed on every flux thimble at every outage since such testing was first begun. The 10 thimbles replaced due to thimble wall thinning were ordered with [wear-resistant] chrome plating and available for replacement during refueling outage 12. However, during cycle 12, after the new chrome-plated thimbles had been ordered, another thimble developed an obstruction which would not allow the incore detector to traverse the thimble. The 11th thimble was replaced due to the obstruction, and not due to through-wall wear. Since a chrome-plated thimble was not available and thimble wear was not a concern for this thimble, an available thimble of original design and manufacturing was used to replace the obstructed thimble. All 58 thimbles were inspected using eddy current testing during refueling outage 15, fall 2006. All thimbles met acceptance criteria for an additional cycle of operation, and no flux thimble tubes were repositioned or replaced during refueling outage 15.

The staff reviewed the applicant's records from past flux thimble tube inspections and noted that eddy current measurements of wall thickness for all flux thimble tubes were recorded at each of the past 12 refueling outages. The staff also noted that the plant's records show when flux thimble tubes have been replaced and whether, or how much, flux thimble tubes have been repositioned.

The staff finds that the applicant's operating records provide detailed plant-specific data on flux thimble wear patterns and wear rates. The staff determines that this plant-specific data has been used to determine when flux thimble tubes require repositioning or replacement. Therefore, the staff finds the applicant's response acceptable.

The staff confirmed that the "operating experience" program element satisfies requirements defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

<u>USAR Supplement</u>. In LRA Section A1.21, the applicant provided the USAR supplement for the Flux Thimble Tube Inspection Program. By letter dated August 31, 2007, the applicant amended LRA Section A1.21 to state:

> The Flux Thimble Tube Inspection Program performs wall thickness eddy current testing of all flux thimble tubes that form part of the reactor coolant system pressure boundary. The pressure boundary includes the length of the tube inside the reactor out to the seal fittings outside the reactor vessel. Eddy current testing is performed on the portion of the tubes inside the reactor vessel. The program implements the recommendations of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors."

> During each outage, flux thimble tube wear is evaluated and inspections performed based on evaluation results. Wall thickness measurements are trended and wear rates are calculated. If the predicted wear (as a measure of percent through-wall) for a given flux thimble tube is projected to exceed the established acceptance criteria prior to the next outage, corrective actions are taken to reposition, cap, or replace the tube.

The staff reviewed this section and determines that the information in the USAR 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 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components

Summary of Technical Information in the Application. LRA Section B2.1.22 describes the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program as consistent with GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components."

The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages cracking, loss of material, hardening, and loss of strength. Visual inspections of the internal surfaces of piping, piping components, ducting, and other components not covered by other AMPs are included in this program. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program uses the work control process to conduct and document inspections. The program's visual inspections during periodic, predictive and corrective maintenance, and surveillance testing detects aging effects that could cause a loss of component-intended function. A review will determine the number of inspection opportunities in the work control process for all systems within the scope of license renewal. In most of the systems, the number of work opportunities are expected to be sufficient to detect aging and provide reasonable assurance that intended functions are maintained. For systems or components where inspections of opportunity are insufficient, an inspection prior to the period of extended operation will provide reasonable assurance that intended functions are maintained.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M38.

During the audit, the staff noted that LRA Section B2.1.22 states that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages cracking, loss of material, and hardening or loss of strength. The staff requested that the applicant clarify what inspection techniques will be utilized to detect degradations such as hardening and loss of strength.

In its response, the applicant clarified that piping and piping components will be inspected for loss of material and that the inspection related to the loss of strength or hardening is only applicable to elastomers in the heating, ventilation, and air conditioning (HVAC) systems. The applicant also stated that physical manipulation during visual inspection of elastomers could be used to verify the absence of hardening or loss of strength. The applicant stated that its new AMP will provide procedural guidance and training required for personnel performing visual inspections.

The staff finds the applicant's response acceptable because it clarified that the planned inspection procedures will include required details to ensure that personnel performing visual inspections have been adequately trained to determine whether a loss of strength has been developed.

The GALL Report "acceptance criteria" program element recommends that indications of various corrosion mechanisms or fouling that would impact component-intended function are reported and evaluated.

During the audit, the staff requested that the applicant explain why the absence of monitoring of fouling was not an exception to this GALL Report program element.

In its response, the applicant stated that monitoring of fouling was not included because it was not identified as an aging effect for any component monitored by this AMP. Furthermore, by letter dated August 31, 2007, the applicant amended LRA Section B2.1.22 to state:

> The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages cracking, fouling, loss of material, and hardening - loss of strength. Fouling has not been identified as an aging effect in any component currently in-scope for this aging management program.

The staff finds the applicant's response of justification acceptable. In addition, the staff finds that the LRA amendment adequately clarifies that fouling is not an aging effect for the components monitored by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

During the audit, the staff reviewed those portions of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for which the applicant claims consistency with GALL AMP XI.M38 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program acceptable because it conforms to the recommended GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," as described below.

The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for which the applicant claims consistency with GALL AMP XI.M38 and finds that it follows the recommendations provided in the GALL Report.

Operating Experience. LRA Section B2.1.22 states that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program. Therefore, no programmatic operating experience has been gained. The applicant stated that the program will be reviewed to account for industry and station operating experience.

During the audit, the staff discussed the details of this program with the applicant's technical personnel who informed the staff that the new Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program (a new program) will be implemented via existing predictive maintenance, preventive maintenance, surveillance testing, and periodic testing work order tasks. Such tasks have been in place since the plant began operation.

Based on the sampling review and discussions with the applicant, the staff finds that these activities have proven effective at maintaining the material condition of systems, structures, and components, and in detecting unsatisfactory conditions.

Based on its review supported by the staff's onsite audit, 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. Therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.22, the applicant provided the USAR supplement for the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program. The applicant committed (Commitment No. 11) to implement the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program prior to the period of extended operation. By letter dated August 31, 2007, the applicant amended LRA Section A1.22 to state:

> The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages cracking, fouling, loss of material, and hardening - loss of strength.

The staff reviewed this section and determines that the information in the amended USAR 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 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Technical Information in the Application. LRA Section B2.1.24 describes the new Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, as consistent with GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, manages the aging effects of embrittlement, melting, cracking, swelling, surface contamination, or discoloration to ensure that electrical cables and connections within the scope of license renewal not subject to the environmental qualification (EQ) requirements of 10 CFR 50.49 can perform its intended functions. Non-EQ cables and connections within the scope of license renewal in accessible areas with adverse environments are inspected. Results of these inspections are representative, with reasonable assurance, of conditions of cables and connections in inaccessible areas with adverse environments. At least once every ten years non-EQ cables and connections within the scope of license renewal in accessible areas are visually inspected for embrittlement, melting, cracking, swelling, surface contamination, or discoloration. The acceptance criterion for visual inspection of accessible non-EQ cable jacket and connection insulating material is the absence of anomalous indications of degradation. Corrective actions for conditions adverse to quality are in accordance with the corrective action program as part of the QA program. The corrective action process provides reasonable assurance that conditions adverse to quality are either promptly corrected or evaluated as acceptable.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.E1.

The staff reviewed the Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, for which the applicant claims consistency with GALL AMP XI.E1 and finds it consistent with the recommendations in the GALL Report.

Operating Experience. LRA Section B2.1.24 states that the Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, is a new program and as such, no programmatic operating experience is available. A review of the plant operating history determined that, in 2001, a steam leak had allowed water to drip onto a cable tray. The steam leak was repaired and the cables were inspected. The applicant stated that no cable degradation was observed.

The staff also reviewed the applicant's evaluation of industry operating experiences identified in the staff's generic communications (i.e., NRC Information Notices (INs) 86-49, 92-81, and 98-21). The staff finds that the plant-specific operating experience did not reveal degradations that are 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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.24, the applicant provided the USAR supplement for the Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program. The applicant committed (Commitment No. 12) to implement the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environment Qualification Requirements Program prior to the period of extended operation. The staff reviewed this section and determines that the information in the USAR 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.9 Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits

Summary of Technical Information in the Application. LRA Section B2.1.25 describes the existing Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program as consistent with GALL AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits."

The scope of this program includes the cables and connections in sensitive instrumentation circuits with sensitive, high-voltage low-level signals, within the ex-core neutron monitoring system, including the source, intermediate, and power range monitors. This program provides reasonable assurance that the intended functions of cables and connections in instrumentation circuits with sensitive, low-level signals, not subject to the EQ requirements of 10 CFR 50.49 and exposed to adverse environments of heat, radiation, or moisture are maintained consistently with the CLB through the period of extended operation. In most areas, the actual ambient environments (e.g., temperature, radiation, or moisture) are less severe than the plant design environment. Calibration surveillance tests manage the aging of the cable insulation and connections so instrumentation circuits perform intended functions. For an instrumentation channel found out of calibration during routine surveillance testing, troubleshooting on the loop, including the instrumentation cable and connections, is performed. A review of calibration results will be completed before the period of extended operation and every 10 years thereafter.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.E2.

The GALL Report "scope of the program" program element includes electrical cables and connections (i.e., cable system) used in circuits with sensitive, high-voltage, low level signals such as radiation monitoring, and nuclear instrumentation. However, the scope of Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program only includes the ex-core neutron monitoring system.

During the audit, the staff requested that the applicant explain why the high range radiation monitoring cable systems are not included within the scope of this program. In its response, the applicant stated that the cable systems associated with the high-range radiation monitor that are within the scope of license renewal are subject to 10 CFR 50.49 environmental requirements and, therefore, are not included in this AMP.

The staff confirmed that high range radiation monitoring cables, J-361A, are included in the EQ master list. The staff finds the applicant's response acceptable because high range radiation monitors are subject to EQ requirements pursuant to 10 CFR 50.49. Therefore, the cable systems associated with the high range radiation systems do not require an AMR.

During the audit, the staff also requested that the applicant identify other sensitive, high-voltage, low level signal circuits, in addition to the ex-core neutron monitoring system at WCGS. The staff requested that the applicant explain why these circuits are not within the scope of the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program.

In its response, the applicant stated that the following is a list of the equipment that uses coaxial cable that could have sensitive, high-voltage, low level signal circuits in addition to the ex-core neutron monitoring systems at WCGS:

- high range area radiation monitors
- containment atmosphere humidity detectors
- unit vent radiation monitors
- solid radwaste system radwaste effluent radiation monitors
- post-accident sample system sampling panels
- loose parts monitoring
- solid radwaste spent resin primary storage tank inlet element and control station
- balance of plant computer
- public address system (intercom)
- plant security system equipment
- generator hydrogen and carbon dioxide system
- miscellaneous control panels (rad camera)
- in-core neutron monitoring system
- condensate demineralizer system acid day tank level

The applicant also stated that these systems do not provide license renewal intended functions and do not meet any criteria found in 10 CFR 54.4(a)(1), (a)(2), or (a)(3), except for high-range area-radiation monitors.

The staff finds the applicant's response acceptable because it clarified that these systems are not within the scope of license renewal and are not within the scope of this program.

The GALL Report states that review of calibration results or surveillance programs finding can provide an indication of aging effects based on the instrumentation circuit performance acceptance criteria related. By reviewing the results obtained during normal calibration or surveillance, an applicant may detect severe aging degradation prior to the loss of the cable and connection intended function. In cases where a calibration or surveillance program does not include the cabling system (i.e., disconnected cables), the applicant should perform a cable system test.

The staff requested that the applicant clarify if the ex-core neutron monitoring cables are disconnected during the calibration surveillance procedure. In its response, the applicant stated that the ex-core neutron monitoring system cables are not disconnected during the calibration procedure.

The staff finds the applicant's response acceptable because it explained that the cables in question are connected during the performance of the calibration procedure. The staff finds that this is consistent with the GALL Report, which explains that testing of cable systems is not required if these cable systems are not disconnected during calibration surveillance.

The staff reviewed the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program for which the applicant claims consistency with GALL AMP XI.E2 and finds it consistent with the recommendations of the GALL Report.

Operating Experience. LRA Section B2.1.25 describes a case where a change in temperature across a high-range radiation monitor cable in containment caused substantial change in the monitor reading. The applicant stated that changes in instrument calibration can be caused by degradation of the circuit cable and are possible indications of electrical cable degradation. Most site-specific and industry-wide operating experience with neutron flux instrumentation circuits relates to cable and connector issues inside of containment near the reactor vessel.

During the audit, the staff noted that in the plant program evaluation report the applicant stated that a review of plant operating experience indicates that there has been no failure of the source, intermediate, and power range instrumentation cables. The applicant also stated that there have been a few problems with loose connectors due to improper connector installation and dirty connectors. Because of circuit problems, testing was performed on the source, intermediate, and power range circuits in 1998, 1999 and 2005. The tests performed in 2005 determined that the condition of the cables for the source and intermediate range circuits remained constant, showing no degradation for the past seven years. However, the cables for the power range circuits indicated an increase in the capacitance between the outer shield and ground near the detector assembly. The applicant evaluated this condition through its corrective action program and found it acceptable.

The staff reviewed samples of problem identification reports and operating experience evaluations and noted that 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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.25, the applicant provided the USAR supplement for the Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program. The applicant committed (Commitment No. 13) to complete a review of the calibration surveillance test results before the period of extended operation and every ten years thereafter. The staff reviewed this section and determines that the information in the USAR 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 Electrical Cables and Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Used in Instrumentation Circuits 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), as evaluated above, 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Technical Information in the Application. LRA Section B2.1.26 describes the new Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, as consistent with GALL AMP XI.E3, "Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, manages the aging effects of inaccessible medium-voltage cables within the scope of license renewal exposed to adverse environments caused by significant moisture and voltage to ensure that they can perform their intended functions. All cable manholes, with non-EQ inaccessible medium-voltage cables that are within the scope of license renewal will be inspected for water collection to be removed as required. This inspection and water removal will be based on actual plant experience with the inspection frequency at least once every two years. All non-EQ inaccessible medium-voltage cables that are within the scope of license renewal will be tested for indications of adverse conductor insulation conditions. There will be a polarization index test as described in EPRI TR-103834-P1-2 or other state-of-the-art testing at least once every ten years. The acceptance criteria for each test will be defined for the specific type of test and specific cable tested. Periodic inspections of cable manholes for water accumulation will minimize cable exposure to water. Corrective actions for conditions adverse to quality are in accordance with the corrective action program as part of the QA program. The corrective action process provides reasonable assurance that conditions adverse to quality are either promptly corrected or evaluated as acceptable.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.E3.

The GALL Report defines medium voltage as voltage from 2 kV to 35 kV. The Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, states that the non-EQ inaccessible medium-voltage cables that are within the scope of license renewal, and that are exposed to significant moisture simultaneously with significant voltage, are 5 kV and 15 kV.

During the audit, the staff requested that the applicant identify any inaccessible medium voltage cables from 2 kV to 35 kV. In its response, the applicant stated that the only medium-voltage cables that are from 2 kV to 35 kV are the 5 kV and 15 kV cables. The scope of this program includes all of the inaccessible voltage cables that are within the scope of the license renewal at WCGS.

The staff finds the applicant's response acceptable because it clarified that none of the inaccessible medium-voltage cables within the scope of this program are greater than 15 kV.

The staff guidance in SRP-LR Section 2.5.2.1.1, states that station blackout (SBO) restoration of offsite power paths should be included within the scope of license renewal. The staff noted that the scope of the applicant's Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, only includes inaccessible medium-voltage cables from disconnect switch 13-23 to the engineered safety features (ESF) transformer. The staff noted that it did not include the underground cables from transformer 7 to disconnect switch 13-23. This inaccessible medium-voltage cable provides connection for the SBO restoration of offsite power path. If this underground cable is not managed, significant aging effects due to moisture can affect its intended function for SBO restoration.

During the audit, the staff requested that the applicant explain how it manages this underground cable to satisfy the criteria in the SRP-LR (and in accordance with the rules) to ensure that SBO restoration of offsite power paths are maintained during the period of extended operation.

In its response, the applicant stated that WCGS includes two paths of SBO restoration power within the scope of license renewal. The connections to the switchyard are through disconnects, not circuit breakers. One path is from disconnect switches 13-21 or 13-23 via underground cable to the station ESF transformer. The applicant stated that this configuration conforms to the requirement of 10 CFR 50, Appendix A, General Design Criterion (GDC) 17, that states "The onsite electrical distribution system shall be supplied by two physically independent circuits designed and located so as to minimize the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions."

The applicant also stated that the entire plant system portion of the SBO restoration power system is within the scope of license renewal. The applicant stated that this conforms with the staff position in the SRP-LR which states, "Consistent with the requirements specified in

10 CFR 54.4(a)(3) and 10 CFR 50.63(a)(1), the plant system portion of the offsite power system should be included within the scope of license renewal."

The applicant stated that the 345 kV switchyard system equipment beyond disconnect 345-163 and the 13.8 kV switchyard system equipment beyond disconnect switches 13-21 and 13-23, including the 13.8 kV switchgear, circuit breaker 13-48; transformers 4, 5, and 7, and the underground cable are part of the offsite transmission system (i.e., grid), and are not part of the plant system portion of the offsite power and; therefore, are not within the scope of license renewal. The applicant also stated that Westar Energy is the owner of the switchyard and is responsible for switchyard equipment design, operation, and maintenance.

The staff found that additional information was necessary to determine if the scoping of these electrical components was performed adequately. As described in SER Section 2.5, in request for information (RAI) 2.5-1 dated April 11, 2007, the staff requested that the applicant further justify why the high-voltage switchyard circuit breakers, 13.8 kV medium-voltage underground cables, and its associated components and structures are not within the scope of license renewal. The applicant responded to the staff's RAIs by letters dated May 9 and August 8, 2007. For the reasons below, the staff finds the applicant's responses unacceptable.

General Design Criteria 17, described in 10 CFR 50, Appendix A, requires that the onsite electrical distribution system be supplied by two physically-independent circuits designed and located to minimize the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. The staff's position in the SRP-LR is that physically-independent power paths are maintained for SBO restoration for offsite power during extended periods of operation. The staff clearly defined the plant's system boundary as the offsite power system. The offsite power system consists of transmission system (i.e., grid) components that provide a source of power and components that connect that power source to the plant's onsite electrical distribution system. For the purposes of the license renewal rule, the staff determines that the relevant portion of the offsite power system that connect to the onsite electrical distribution systems should be included within the scope of license renewal. This path includes the switchyard circuit breakers that connect the offsite system power transformers (i.e., startup transformers), the transformers themselves, the relevant intervening overhead or underground circuits between the circuit breaker and the transformer and the transformer and onsite electrical distribution system, and its 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 subjected to an AMR guarantees that the bases underlying the SBO requirements are maintained over the period of the extended license. This is consistent with the NRC expectations in including the SBO regulated event as described under 10 CFR 54.4(a)(3) of the license renewal rule. Managing only a portion of the independent power path (i.e., the equipment beyond disconnect switches 13-21 and 13-23) does not satisfy the staff's guidance in the SRP-LR. Further, the fact that Westar Energy is the owner of the switchyard does not preclude the applicant from managing the complete circuit paths. The staff believes that the subject components should be included within the scope of license renewal and managed by this AMP. Therefore, this has been identified as open item (OI) 3.0.3.1.10-1.

In a letter dated March 29, 2008, ET 08-0022, the applicant stated that in response to OI 2.5-1, the applicant has included the inaccessible medium voltage switchyard cable from disconnect 13-23 up to breaker 13-48 within the scope of license renewal. Per 10 CFR 54.4(a)(3), the AMP related to inaccessible medium voltage cable not subject to 10 CFR 50.49, EQ requirements applies to this cable. In a March 29, 2008 letter, ET 08-0021, to resolve OI 3.0.3.1.10-1, the applicant submitted Amendment 6 to the LRA to provide changes to the license renewal scope. As a part of this submittal, the underground cables from circuit breaker 13-48 to disconnect switch 13-23 will be included in the scope of inaccessible medium-voltage cable not subject to 10 CFR 50.49 EQ requirements AMP. This will ensure that long-lived passive structure and components that are parts of SBO offsite power restoration paths are maintained consistent with CLB during the period of extended operation. The staff finds the applicant's response to OI 3.0.3.1.10-1 acceptable. OI 3.0.3.1.10-1 is closed.

The staff reviewed the Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Requirements Program requirements for which the applicant claims consistency with GALL AMP X1.E3. The staff finds it is consistent with the GALL report recommendations.

Operating Experience. LRA Section B2.1.26 states that the non-EQ inaccessible medium voltage cables within the scope of license renewal exposed to significant moisture and voltage are 5kV and 15kV Kerite cables with high-temperature Kerite insulation. According to Sandia report SAND96-0344, Section 4.1.2.5, industry operating experience shows that water treeing is much less prevalent with this insulation type than in cable with cross-linked polyethylene insulation. The applicant stated that a review of the plant operating history determined that water has accumulated in cable manholes. In 2004, the cable manholes for these in-scope medium-voltage cables exposed to significant moisture and voltage were inspected for degradation of the cable support members due to water. All cable support members were found satisfactory. In addition, the applicant stated that there has been no failure of inaccessible medium-voltage cables.

The staff reviewed operating experience in the program evaluation report and noted that in the applicant identified a substantial amount of water in manhole 119. This manhole contains 13.8 kV cable that goes to the circulation water pumps. This manhole also contains other medium-voltage cables that are within the scope of license renewal. It appeared that no corrective action was taken because the applicant performed an evaluation and concluded that the cable was qualified to be submerged. The staff noted that if these cables were allowed to be wet for a period of time, there is a possibility of cable degradation that can affect their safety functions during the period of extended operation.

During the audit, the staff requested that the applicant describe corrective actions taken to address water problems in manholes. The staff also requested that the applicant clarify if the manhole inspection procedures will be implemented during the period of extended operation. In its response, the applicant stated that the evaluation of this issue was based on the criteria available at that time. Since 1998, additional guidance and information has become available. Based on this information, the applicant initiated a preventive maintenance program to periodically inspect applicable manholes containing medium-voltage cables. This inspection includes removal of water (if required), visual inspection for corrosion and degradation of the cable tray support, and visual inspection for cable jacket degradation. The applicant also stated that preventive maintenance will be implemented before the period of extended operation.

During the regional onsite inspection performed during the week of September 22, 2007 (documented in inspection report IR 05000482/2007007), the inspectors found water in the emergency service water cable manholes. The staff noted that these cables are within the scope of license renewal. The staff finds that this incident demonstrates that the corrective actions previously described by the applicant have not been properly implemented or were not adequate. In light of this operating experience, the staff is concerned that cables that were submerged for a period of time may not perform their intended functions during the period of extended operation. The inspection and water removal frequency of at least once every two years, as proposed in the applicant's Inaccessible Medium-Voltage Not Subject to 10 CFR 50.49, Environment Qualification Requirements Program, may not be adequate to detect water accumulation in the manholes.

During the inspection, as documented in the inspection report dated December 5, 2007, the staff discussed the details of this program with the applicant's technical personnel. The staff expressed concerns that the draft program procedure failed to ensure that inaccessible cables that are within the scope of license renewal would be kept dry during the period of extended operation. As a result, the applicant revised the draft procedure to include operating history when determining the frequency of cable vault pumping and clarified its requirement that the cables were to remain dry before entering the period of extended operation. In addition, the applicant revised the procedure to ensure that if any cable is found submerged: (1) a work request will be initiated, (2) the manhole will be pumped dry, and (3) the inspection frequency will be increased.

The staff noted that the applicant claims that the subject emergency service water cables are qualified for being submerged. However, the staff disagrees with the applicant's position. The staff noted that this is currently being evaluated as a current operating license issue under the requirements of 10 CFR Part 50. However, the staff determined there is reasonable assurance that if the AMP is implemented as described, the aging effects of these inaccessible cables will be adequately managed during the period of extended operation. The staff finds that the applicant will evaluate its plant-specific operating experience to determine if the inspection frequency for these manholes should be increased to ensure that the cables are maintained dry. The staff finds that the AMP implementing procedure has been revised to ensure that if water is found during the increased inspection frequency, additional actions must be considered to keep the cables from becoming submerged.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.26, the applicant provided the USAR supplement for the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program. The applicant committed (Commitment No. 14) to implement the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirement Program, prior to the period of extended operation. The staff reviewed this section and determines that the information in the USAR 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 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, the staff finds all program elements as documented in the LRA 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.11 10 CFR 50, Appendix J

Summary of Technical Information in the Application. LRA Section B2.1.30 describes the existing 10 CFR 50, Appendix J Program as consistent with GALL AMP XI.S4, "10 CFR 50, Appendix J."

The 10 CFR Part 50, Appendix J Program monitors leakage rates through the containment pressure boundary, including the penetrations and access openings, to detect degradation of containment pressure boundary. Seals, gaskets, and bolted connections are also monitored under the program. Containment leak rate tests assure that leakage through the primary containment and systems and components penetrating primary containment do not exceed allowable leakage limits in the technical specifications. Corrective actions are taken if leakage rates exceed established administrative limits for individual penetrations or the overall containment pressure boundary. Type A tests measure the containment overall integrated leakage rate. Program 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. In addition, there were visual examinations of containment, as described by RG 1.163, during two other refueling outages between 10-year interval Type A tests. Type B local leak rate tests on containment pressure boundary access penetrations are performed at frequencies that comply with the requirements of 10 CFR Part 50 Appendix J, Option B. The Type B test is intended to detect or measure leakage across pressure-retaining or leakage-limiting boundaries other than valves. Type C local leak rate tests on containment isolation valves are performed at frequencies that comply with the requirements of 10 CFR Part 50, Appendix J, Option B.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff interviewed the applicant's technical staff and reviewed documents related to the 10 CFR 50, Appendix J Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with the corresponding elements of GALL AMP XI.S4.

The staff reviewed the 10 CFR 50, Appendix J Program, for which the applicant claims consistency with GALL AMP XI.S4 and finds that it follows the recommendations of the GALL Report.

Operating Experience. LRA Section B2.1.30 states that the most recent Type A test was performed in October 2000. The 95-percent confidence limit was 0.59 percent/24 hours (La). Type A tests in the third (1988) and fifth (1991) refueling outages showed leakages of 0.56 La and 0.35 La, respectively. The integrated leakage rate test acceptance criterion is 1.0 La (as-found). There are Types B and C tests at various intervals for the many different penetrations. The applicant stated that the results of the Type B and C tests are combined and the total combined leakage is updated after each test. The Types B and C combined leakage rate acceptance criterion is 0.6 La (250,000 sccm). The combined Type B and C maximum path leakage rate used during refueling periods was 49,710 sccm as of November 2005. The combined Type B and C minimum path leakage rate used when the plant is in Modes 1 through 4 was 21,641 sccm as of November 2005. The applicant stated that the Types B and C test failures noted in the past have been due to debris, corrosion products, and general degradation of valve seating surfaces. Most of these failures were corrected by replacement of the seat, valve flushing, or valve seat lapping.

The LRA states that one gasket degradation has been noted. The gasket, which was installed in 1989, exhibited an increasing leakage trend since 1993 and was replaced in 1997. In addition, there was a failure of the T-ring seal on the purge supply damper. The T-Ring seal, which was installed in 1985, failed in 1997. Subsequently, the T-ring seal was replaced. The applicant stated that in both of these cases, the 10 CFR 50, Appendix J Program detected the condition and initiated corrective actions.

During the audit, the staff reviewed the applicant's documentation for the gasket degradation incident described above. The gasket addressed in this incident was the equipment hatch gasket, which was made of ethylene propylene diene monomer rubber. The replacement gasket was made of the same material as that of the original gasket. The staff reviewed the leakage rates recorded by the applicant from the tests performed after the gasket was replaced in 1997. For the eight leakage tests performed between November 1997 and November 2006, the leakage rates measured for the replaced hatch gasket ranged between 0 to 170 sccm, with an error margin of 4 to 20 sccm, respectively, against the leakage acceptance criteria of 4200 sccm. In addition, the staff also interviewed the applicant's technical personnel on the 10 CFR 50, Appendix J Program, details such as the "as found" leakage rates versus the administrative leakage limits, test intervals for type A, B and C tests, adjustment of the type A test interval when the leak rate testing yielded unacceptable results, and the corrective action process to address the test results that are not acceptable.

During the audit, the staff reviewed a sampling of the implementing procedures and problem identification reports related to the applicant's 10 CFR 50, Appendix J Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the 10 CFR 50, Appendix J Program, test results and where the applicant had implemented corrective actions.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.30, the applicant provided the USAR supplement for the 10 CFR 50, Appendix J Program. The staff reviewed this section and determines that the information in the USAR 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2 AMPs Consistent with the GALL Report with Exceptions 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:

- ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Water Chemistry
- Reactor Head Closure Studs
- Boric Acid Corrosion
- Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors
- Flow-Accelerated Corrosion
- Bolting Integrity
- Steam Generator Tube Integrity
- Closed-Cycle Cooling Water System
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Fire Protection
- Fire Water System
- Fuel Oil Chemistry
- Selective Leaching of Materials
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping
- Lubricating Oil Analysis
- ASME Section XI, Subsection IWE
- ASME Section XI, Subsection IWL
- ASME Section XI, Subsection IWF
- Masonry Wall Program
- Structures Monitoring Program
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Metal Fatigue of Reactor Coolant Pressure Boundary
- Environmental Qualification (EQ) of Electrical Components
- Concrete Containment Tendon Prestress

For AMPs that the applicant claimed are consistent with the GALL Report, with exception and/or enhancement, the staff performed an audit and review to confirm that those attributes or features of the program for which the applicant claimed consistency were indeed consistent. The staff also reviewed the exception and/or enhancement 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 ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD

Summary of Technical Information in the Application. LRA Section B2.1.1 describes the existing ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program as consistent, with exceptions, with GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program inspections are performed to manage cracking, surface and subsurface discontinuities, loss of fracture toughness, loss of material, and physical damage in Class 1, 2, and 3 piping and components within the scope of license renewal. The program includes periodic visual, surface, and volumetric examinations and leakage tests of Class 1, 2, and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. WCGS inspections meet ASME Code Section XI requirements. The ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is in accordance with 10 CFR 50.55a and the ASME Code Section XI, 1998 Edition through 2000 addenda. WCGS weld examinations for Class 1 and 2 piping are in accordance with risk-informed inservice inspection (RI-ISI) selection and examination requirements. RI-ISI includes an evaluation for degradation mechanisms like flow accelerated corrosion, water hammer, thermal fatigue, high-cycle fatigue, corrosion, and SCC and is based on the methodology described in EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure." In compliance with 10 CFR 50.55a(g)(4)(ii), the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code 12 months before the start of the inspection interval.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains 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 ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M1.

The staff noted that the LRA lists six exceptions to the GALL Report. The six exceptions are the following:

(1) WCGS ASME Section XI, Inservice Inspection Program, uses ASME Code 1998 Edition through the 2000 addenda. NUREG -1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC and IWD" is based on

ASME Code, 2001 edition through 2002 and 2003 addenda. The use of the 1998 version of the ASME Code through 2000 addenda is consistent with provisions in 10 CFR 50.55a that allow use of the code in effect 12 months prior to the start of the inspection interval.

(2) WCGS uses the RI -ISI Program for ASME Code Section XI Tables IWB-2500-1 and IWC-2500 -1, Examination Categories B-F, B-J, C-F-1 and C-F -2 for Class 1 and 2 piping welds.

(3) WCGS ASME Section XI, Inservice Inspection Program, uses Code Case N-623 for examination and inspection requirements for deferral of inspection of shell to flange and head to flange welds in the reactor vessel.

(4) WCGS ASME Section XI, Inservice Inspection Program, uses Code Case N-648-1, with the condition specified in RG 1.147 for examination and inspection requirements for Examination Category B-D, Full Penetration Welded Nozzles in Vessels, for reactor vessel nozzles.

(5) WCGS ASME Section XI, Inservice Inspection Program, uses 10 CFR 50.55a, Section (b)(2)(xxi), for examination and inspection requirements for Examination Category B-D, Full Penetration Welded Nozzles in Vessels, for steam generator and pressurizer nozzles.

(6) WCGS ASME Section XI, Inservice Inspection Program, uses Code Case N-700 for examination and inspection requirements for Examination Categories B-K, C-C, and D-A (Welded Attachments for Vessels, Piping, Pumps, and Valves).

In its review of exception (5), the staff noted that 10 CFR 50.55a, Section (b)(2)(xxi), imposes examination and inspection requirements from the ASME Code, Section XI, 1998 Edition, and are more stringent than, the corresponding requirements from later ASME Code, Section XI, editions and addenda.

During the audit, the staff requested that the applicant clarify why item (5) was listed as an exception to the GALL Report.

In its response, the applicant stated that the LRA will be amended to delete exception (5) from the list of exceptions.

Because exception (5) describes requirements of the applicant's program that are imposed by 10 CFR 50.55a and the requirements include, and are more stringent than, the corresponding requirements imposed by the ASME Code, Section XI, edition and addenda referenced in the GALL Report, the staff finds that item (5) is not an exception to GALL AMP XI.M1. On this basis, the staff finds that it is acceptable for the applicant to delete exception (5) from the list of exceptions to the GALL Report.

Because current approval to use RI-ISI or ASME Code, Section XI, code cases does not provide justification or a basis for their use during the period of extended operation, the staff requested that the applicant clarify why the LRA identifies items (2), (3), (4), and (6) as exceptions to the GALL Report.

In its response, the applicant stated that the LRA will be amended to delete exceptions to GALL AMP XI.M1 that are related to RI-ISI or ASME Code, Section XI, code cases. The applicant stated that the LRA will be revised to delete exceptions (2), (3), (4), and (6). The applicant stated that the LRA amendment will also affect the summary description of the AMP in LRA Section A1.1, and the program description in LRA Section B2.1.1.

The staff noted that the applicant's current 10-year ISI interval ends on September 2, 2015, approximately ten years before the start of the period of extended operation. Because currently approved alternatives to ASME Code, Section XI, requirements expire at the end each 10-year ISI interval, the applicant's use of RI-ISI or ASME Code, Section XI, code cases will not continue into the period of extended operation without required approval pursuant to 10 CFR 50.55a. Because currently approved alternatives to ASME Code, Section XI, requirements do not continue into the applicant's period of extended operation, the staff finds that it is acceptable to delete exceptions (2), (3), (4), and (6) from the list of exceptions to GALL AMP XI.M1.

By letter dated August 31, 2007, the applicant amended the LRA to delete the following sentences from the "program description" in LRA Section B2.1.1:

> WCGS weld examinations for Class 1 and Class 2 piping are performed in accordance with Risk-Informed Inservice Inspection (RI-ISI) selection and examination requirements. RI-ISI includes an evaluation for degradation mechanisms such as flow accelerated corrosion, water hammer, thermal fatigue, high cycle fatigue, corrosion and stress corrosion cracking and is based on the methodology described in EPRI TR-112657, "Revised Risk-Informed Inservice Inspection Evaluation Procedure."

By letter dated August 31, 2007, the applicant also deleted five of six exceptions listed in the LRA and revised the remaining exception to read as stated in the following paragraph.

<u>Exception</u>. In the LRA, as amended by letter dated August 31, 2007, the applicant credited an exception to the GALL Report program elements "scope of the program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions." Specifically, the exception states:

> NUREG-1801, Section XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" specifies the use of ASME Section XI, 2001 edition through 2002 and 2003 addenda. WCGS third interval ISI Program uses ASME Code, 1998 Edition through the 2000 addenda. The use of the 1998 version of the ASME Code through 2000 addenda is consistent with provisions in 10 CFR 50.55a to use the Code in effect 12 months prior to the start of the inspection interval. WCGS will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

The staff noted that the affected program elements are those where GALL AMP XI.M1 includes a reference to specific ASME Code, Section XI, requirements. The staff finds that this is an exception to the GALL Report's recommendations because the applicant's ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is based on ASME

Code, Section XI, editions and addenda that are different from the ASME Code, Section XI, edition and addenda referenced in the GALL Report.

The staff noted that the applicant's use of ASME Code, Section XI, 1998 Edition through 2000 Addenda for the third 10-year inspection interval has been approved pursuant to 10 CFR 50.55a, and that the third 10-year inspection interval does not continue into the period of extended operation. The staff also noted that the ASME Code Section XI editions and addenda used by the applicant during the period of extended operation will be pursuant to the requirements of 10 CFR 50.55a that are applicable for future 10-year inspection intervals.

During the period of extended operation the applicant will use ASME Code Section XI editions and addenda that are then currently endorsed by the staff pursuant to 10 CFR 50.55a as a basis for its ASME Code Section XI Inservice Inspection, Subsection IWB, IWC, and IWD Program. The staff-endorsed ASME Code Section XI editions and addenda, provide requirements for ISI that are comparable to those referenced in the GALL Report; therefore, the staff finds that the applicant's use of ASME Code Section XI editions and addenda which differ from those referenced in the GALL Report is acceptable. On this basis, the staff finds that the applicant's exception to GALL AMP XI.M1 is acceptable.

The staff reviewed those portions of the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program for which the applicant claims consistency with GALL AMP XI.M1 and finds that they are consistent with the GALL AMP. The staff finds the applicant's ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program acceptable because it conforms to the recommended AMP with the exception described.

Operating Experience. LRA Section B2.1.1 states that plant-specific operating experience for the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program reveals no implementation issues. This program is updated to account for industry operating experience. In addition, the ASME Code Section XI is revised every three years and addenda issued in the interim for code updates to reflect industry operating experience. The applicant stated that the requirement to update the ASME Code Section XI Inservice Inspection Program with references to more recent editions of ASME Code Section XI at the end of each inspection interval makes the program reflect enhancements by operating experience incorporated into ASME Code Section XI.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation that is not bounded by industry experience.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's ASME Code Section XI, Subsection IWB, IWC, and IWD Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the ISI program. The staff noted that the applicant had implemented appropriate and timely corrective actions, relative to the ISI program.

The staff requested that the applicant discuss any current challenges related to inspections and examinations required by ASME Code Section XI. The staff found no instances where the plant's equipment arrangement or configuration prevented the applicant from examining components specified in the ASME Code Section XI (accessibility of physical configuration). Where deviations from the inspection requirements were taken (e.g., the inspection area or technique was not entirely consistent with the requirements of ASME Code Section XI), acceptable alternatives to the specified examination were approved pursuant to 10 CFR 50.55a. The staff found no omissions in the applicant's current program that have resulted in failure to maintain the intended functions of components that are within the scope of the program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.1, the applicant provided the USAR supplement for the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD. In its letter dated August 31, 2007, the applicant amended LRA Section A1.1 to state:

> ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD inspections are performed to manage aging in Class 1, 2, and 3 piping and components within the scope of license renewal. The program includes periodic visual, surface, volumetric examinations and leakage tests of Class 1, 2 and 3 pressure-retaining components, including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting. WCGS inspections meet ASME Section XI requirements and can manage aging such as cracking, surface and subsurface discontinuities, loss of material, loss of fracture toughness, and physical damage. The WCGS ISI Program is in accordance with 10 CFR 50.55a and ASME Section XI, 1998 edition through 2000 addenda.

The staff reviewed this section and determines that the information in the USAR 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 ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 Water Chemistry

Summary of Technical Information in the Application. LRA Section B2.1.2 describes the existing Water Chemistry Program as consistent, with exception, with GALL AMP XI.M2, "Water Chemistry."

The Water Chemistry Program maintains the chemical environment in the reactor coolant system and related auxiliary systems containing treated borated water and the chemical environment in the steam generator secondary side and the secondary cycle systems to limit aging effects of corrosion mechanisms and SCC. The methods for managing both the primary and secondary chemical environments rely on (1) limiting the concentration of chemical species known to cause corrosion and (2) adding chemical species known to inhibit degradation by their influence on pH and dissolved oxygen levels. Water chemistry control is most effective in areas of high flow and thorough mixing where the monitoring samples represent actual conditions. For low-flow areas and stagnant portions of the systems, sampling may not be as effective in determining local environmental conditions, and a one-time inspection of a representative group of components verifies the effectiveness of the Water Chemistry Program.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remains 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 Water Chemistry Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M2.

The GALL Report "scope of the program" program element states that water chemistry control is performed in accordance with the guidelines in EPRI TR-105714, Revision 3, for primary water chemistry in pressurized-water reactors (PWRs), EPRI TR-102134, Revision 3, for secondary water chemistry in PWRs, or later revisions. The Water Chemistry Program "scope of the program" program element states that the program accomplishes this task by monitoring and controlling known detrimental contaminants like chlorides, fluorides, dissolved oxygen, and sulfate concentrations for water chemistry based on the guidelines in EPRI TR-105714, Revision 5, for primary water chemistry and TR-102134, Revision 6, for secondary water chemistry.

The staff noted that when EPRI TR-102134 was revised, it was issued a new number. It is now EPRI TR-108224, Revision 6. The Water Chemistry Program still references EPRI TR-102134, Revision 6. The staff requested that the applicant clarify this discrepancy.

In its letter dated August 31, 2007, the applicant amended LRA Section B2.1.2 to specify that the Water Chemistry Program is consistent with EPRI TR-108224, Revision 6. On this basis, the staff finds the applicant's response acceptable.

The staff found this use different from the GALL Report recommendation and requested that the applicant: (1) compare the monitored parameters for EPRI TR-105714, Revision 3 to Revision 5 and EPRI TR-102134, Revision 3 to Revision 6, (2) explain why use of a later version is acceptable by verifying that none of the controlled parameters are relaxed in the later version, and (3) justify why this is not considered an exception to the GALL Report.

In its response, the applicant stated that the GALL Report "scope of the program" program element states that "water chemistry control is in accordance with industry guidelines such as... EPRI TR-105714 for primary water chemistry in PWRs, and EPRI TR-102134 for secondary water chemistry in PWRs." The applicant stated that no EPRI revisions are specified in the program element; therefore, no exception was taken with respect to EPRI revisions. The applicant also provided a list of changes between the different revisions.

The staff finds the applicant's response acceptable because the GALL Report states that later revisions of the EPRI documents are acceptable. Therefore, the staff finds that an exception to the GALL Report is not necessary. The staff reviewed the changes between the different revisions of the EPRI document and finds the applicant's use of the later revisions acceptable because the parameters of operation in EPRI TR-105714, Revision 5, or the formerly used EPRI TR-102134, Revision 6 (now EPRI TR-108224, Revision 6), were generally the same or more conservative than those of Revision 3.

Exception. In the LRA, the applicant credited an exception to the GALL Report program element "scope of the program." Specifically, the exception states:

> When in wet layup conditions, WCGS is meeting the requirements for mixing of the steam generator bulk solution. This ensures the chemistry of the bulk fluid is uniform and that samples are representative of the bulk steam generator secondary side water. The WCGS design incorporates pumps for periodic recirculation of the steam generator fluid in wet layup conditions. Operating experience has shown that a 33-hour recirculation period will provide adequate bulk mixing. If sample results after 33 hours of recirculation indicate a failure to meet the layup specifications, corrective action is taken to correct the layup mixture. After any chemical additions necessary to adjust chemistry, the steam generator is recirculated for another 33 hours prior to sampling. The intent of the EPRI Secondary Water Chemistry Guidelines for mixing is met after 33 hours of recirculation. Three samples per week are not necessary to demonstrate adequate mixing.

The staff requested that the applicant confirm if there was an analysis that states that when in wet layup conditions, a 33-hour recirculation of steam generators followed by weekly sampling is better than, or equivalent to, obtaining three samples per week until values are stable.

In its response, the applicant stated that this exception was taken based on operating experience. Prior to initial fill of the steam generators during plant construction, calculations were performed to determine the required recirculation time to achieve mixing of the bulk solution. This calculation was based on the steam generators volume, flow-rate of the mix pumps, and recirculating three volumes of the bulk solution. The result indicated that a 33-hour recirculation time would thoroughly mix the bulk solution. The use of the 33-hour mix time became standard practice. Once in wet layup with chemicals added, the steam generators are mixed for 33 hours and then sampled to analyze for the desired chemical environment. Then, recirculation and sampling are done weekly in accordance with AP 02-002, "Chemistry Surveillance Program." Experience has shown that once the steam generators bulk solution meets required specifications, it remains satisfactory. If the parameters set forth in AP 02-003 are not met, adjustments are made and the recirculation and sampling is repeated.

The staff noted from the license renewal program evaluation report that the WCGS design incorporates pumps for recirculation of the steam generator fluid. Because the applicant had performed calculations based on the steam generator volume, flow-rate of the mix pumps and recirculating three volumes of the bulk solution, and based on the plant operating history of over 20 years, the staff finds this exception acceptable.

The staff reviewed those portions of the Water Chemistry Program for which the applicant claims consistency with GALL AMP XI.M2 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Water Chemistry Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.2 states that the primary and secondary water chemistry control programs have been developed in accordance with the EPRI primary and secondary water chemistry control guidelines and therefore benefit from the industry operating experience available when the EPRI guidelines were issued. The applicant's Strategic Primary Water Chemistry Plan incorporates nine specific topics of WCGS primary chemistry operating history into the top-level document for the primary chemistry control strategy. The Strategic Secondary Water Chemistry Plan incorporates WCGS secondary chemistry operating history of iron transport reduction, condenser integrity, and dissolved oxygen control into the top-level document setting the secondary chemistry control strategy.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Water Chemistry Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the Water Chemistry Program and where the applicant had implemented corrective action. The staff noted that the applicant's corrective actions were timely and appropriate.

The staff noted several problem identification reports where limits on contaminants, such as chlorides, sulfates, and pH, had been exceeded. The staff also noted that the license renewal program evaluation report states that there have been no major chemical excursions during the plant's operating history. The staff requested that the applicant explain what "major" means.

In its response, the applicant stated that although the Water Chemistry Program is intended to maintain water chemistry parameters within specifications, it is recognized that water chemistry parameters may occasionally exceed the limits specified in the plant procedures. As the amount of departure from specifications increases, action levels increase. Prompt graduated corrective actions are specified at each action level to eliminate or mitigate degradation from the out-of-specification condition. A "major" chemical excursion, as discussed in the license renewal application, is an event where one or more chemical species exceeded an action level and did not comply with the procedurally-specified corrective actions. None of the identified problem identification reports address events that did not comply with the procedurally-specified corrective actions.

Based on the definition of "major," the staff agrees with the applicant that there have been no major chemical excursions during the plant's operating history. Because the appropriate corrective actions, as specified for each action level, were taken and compliance was achieved, the staff finds the applicant's response acceptable.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.2, the applicant provided the USAR supplement for the Water Chemistry Program. The staff reviewed this section and determines that the information in the USAR 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 Water Chemistry Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and their justifications and determine 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 Reactor Head Closure Studs

Summary of Technical Information in the Application. LRA Section B2.1.3 describes the existing Reactor Head Closure Studs Program as consistent, with exceptions, with GALL AMP XI.M3, "Reactor Head Closure Studs."

The Reactor Head Closure Studs program conducts ASME Code Section XI inspections of reactor vessel flange stud hole threads, reactor head closure studs, nuts, and washers to identify and manage cracking and loss of material. The program includes periodic visual, surface, and volumetric examinations of reactor vessel flange stud hole threads, reactor head closure studs, nuts, and washers and visually inspects the reactor vessel flange closure during primary system leakage tests. The program implements the ASME Code Section XI, Subsection IWB, 1998 Edition through the 2000 Addenda and manages reactor vessel stud, nut and washer cracking, loss of material, and reactor coolant leakage from the reactor vessel flange. In compliance with 10 CFR 50.55a(g)(4)(ii), the ASME Code Section XI Inservice Inspection Program is updated each successive 120-month inspection interval to comply with the requirements of the latest ASME Code edition specified 12 months before the start of the inspection interval.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains 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 evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M3.

The staff noted that the LRA lists the following three exceptions to the GALL Report:

(1) NUREG-1801, Section XI.M3 specifies the use of ASME Code Section XI, Subsection IWB, 2001 edition with addenda 2002 and 2003. WCGS' third interval ISI Program is using ASME Code Section XI 1998 Edition through 2000 addenda as modified by 10 CFR 50.55a, and approved code cases. Use of the 1998 Code through 2000 addenda is consistent with provisions in

10 CFR 50.55a to use the ASME Code in effect 12 months prior to the start of the inspection interval.

(2) NUREG-1801, Section XI.M3 specifies the use of ASME Code Section XI, Subsection IWB, Table 2500-1 for reactor vessel flange stud holes, reactor head closure studs, nuts, and washers. The WCGS ASME Code Section XI ISI Program uses approved Code Case N–652 for examination and inspection requirements for Examination Category B-G-1, Pressure Retaining Bolting Greater than 2 inches in diameter, for WCGS reactor vessel flange stud holes, reactor head closure studs, nuts, and washers.

(3) NUREG-1801, Section XI.M3, specifies the use of NRC Regulatory Guide 1.65, "Materials and Inspections for Reactor Vessel Closure Studs" for reactor head closure studs and nuts. WCGS is committed to Regulatory Guide 1.65 with three exceptions. These exceptions are discussed in USAR Appendix 3A as follows:

a. The use of modified SA-540, Grade B-24 stud material as specified in Code Case 1605 has been found acceptable to the NRC for this application within the limitations discussed in Regulatory Guide 1.85, "Material Code Case Applicability."

b. The use of stud bolting material that does not exceed 170 ksi tensile strength. The closure stud bolting material is procured to a minimum yield strength of 130 ksi and a minimum tensile strength of 145 ksi. This strength level is compatible with the fracture toughness requirements of 10 CFR 50, Appendix G (paragraph I.C), although higher strength level bolting materials are permitted. Additional design considerations that permit visual and/or nondestructive inspection and prevent exposure to borated water also apply.

c. Inservice inspection of the reactor vessel closure studs is performed in accordance with ASME Code Case N–652 and does not follow the guidance of regulatory Guide 1.65. The NRC has approved the use of Code Case N–652 in Regulatory Guide 1.147.

In its review of exception (2), the staff noted that ASME Code Section XI, Code Case N-652, examination requirements have been incorporated into ASME Code Section XI, 2001 Edition through 2002 and 2003 Addenda, which is the basis for GALL AMP XI.M3. Because the examination requirements of Code Case N-652 are consistent with those referenced in GALL AMP XI.M3, and because the use of specific code cases is approved pursuant to 10 CFR 50.55a, not as part of the license renewal process, the staff requested that the applicant clarify why the use of Code Case N-652 was listed as an exception to the GALL Report.

In its response, the applicant stated that the LRA will be amended to remove references to code cases from LRA Section B2.1.3. The applicant stated that after this change the Reactor Head Closure Studs Program will credit only two exceptions to the GALL Report.

By letter dated October 11, 2007, the applicant amended LRA Section B2.1.3 to delete exception (2), and modify exceptions (1) and (3).

The staff noted that examination requirements for reactor head closure studs provided in Code Case N-652 are different from the requirements in ASME Code Section XI, 1998 Edition through 2000 Addenda, which is the basis for the applicant's current 10-year ISI interval. However, those examination requirements have been incorporated into ASME Code Section XI, 2001 Edition, with 2002 and 2003 Addenda, which is the basis for GALL AMP XI.M3. On the basis that the applicant's examination requirements are consistent with the ASME Code Section XI editions and addenda referenced in the GALL Report, the staff finds that it is acceptable to delete the second exception originally listed in LRA Section B2.1.3.

Exception 1. In the LRA, as revised by the letter dated October 11, 2007, the applicant credited an exception to the GALL Report program elements "scope of the program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," and "corrective actions." Specifically, the exception states:

> NUREG 1801, Section XI.M3 specifies the use of ASME Section XI, Subsection IWB, 2001 edition with addenda 2002 and 2003. WCGS third interval ISI Program is using ASME Section XI 1998 Edition through 2000 addenda. Use of the 1998 Code through 2000 addenda is consistent with provisions in 10 CFR 50.55a to use the ASME Code in effect 12 months prior to the start of the inspection interval. WCGS will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the period of extended operation.

The staff noted that the affected program elements are those where GALL AMP XI.M3 includes a reference to specific ASME Code Section XI requirements. The staff finds that this is an exception to the GALL Report's recommendations because the applicant's Reactor Head Closure Studs Program is based on ASME Code Section XI editions and addenda that are different from the ASME Code Section XI edition and addenda referenced in the GALL Report.

The staff noted that the applicant is in its third 10-year inspection interval and that use of ASME Code Section XI, 1998 Edition through the 2000 Addenda, for the third 10-year inspection interval is consistent with the requirements of 10 CFR 50.55a. The staff also noted that the third 10-year inspection interval ends on September 2, 2015, and does not continue into the period of extended operation. The applicant uses ASME Code Section XI editions and addenda that are currently endorsed by the staff pursuant to 10 CFR 50.55a as a basis for its Reactor Head Closure Studs Program during the period of extended operation. The staff finds that the endorsed code examination requirements are adequate to identify potential degradation in reactor head closure studs, nuts, and washers. Therefore, the staff finds that use of ASME Code Section XI editions and addenda different from those referenced in the GALL Report is acceptable.

Exception 2. In the LRA, as revised by the letter dated October 11, 2007, the applicant credited an exception to the GALL Report program elements "scope of the program" and "corrective actions." Specifically, the exception states:

> NUREG-1801 AMP XI.M3 specifies the use of NRC Regulatory Guide 1.65, "Material and Inspections for Reactor Vessel Closure Studs" for reactor head

closure studs and nuts. WCGS uses NRC Regulatory Guide 1.65, except: (a) modified SA-540, Grade B-24 stud material is used; (b) stud bolting material was procured with a minimum yield strength of 130 ksi and a minimum tensile strength of 145 ksi; and (c) volumetric inspection of removed studs is performed per ASME Code Section XI.

The staff noted that the affected program elements are those where GALL AMP XI.M3 includes a reference to RG 1.65. The staff finds that this is an exception to the GALL Report's recommendations because the applicant's program is not in conformance with all of the material and inspection guidance in RG 1.65, as recommended in GALL AMP XI.M3.

The applicant provided the following discussion of this exception:

> NUREG-1801, Section XI.M3, specifies the use of NRC Regulatory Guide 1.65, "Material and Inspections for Reactor Vessel Closure Studs" for reactor head closure studs and nuts. WCGS is committed to Regulatory Guide 1.65, with three exceptions. These are discussed in USAR Appendix 3A as follows:
>
> a. Modified SA-540, Grade B-24 stud material is used. The use of this material is within the limitations discussed in Regulatory Guide 1.85, Materials Code Case Acceptability.
>
> b. Stud bolting material that does not exceed 170 ksi tensile strength is used. The closure stud bolting material is procured to a minimum yield strength of 130 ksi and a minimum tensile strength of 145 ksi. This strength level is compatible with the fracture toughness requirements of 10 CFR 50, Appendix G (paragraph I.C), although higher strength level bolting materials are permitted. Additional design considerations that permit visual and/or nondestructive inspection and prevent exposure to borated water also apply.
>
> c. Inservice inspection of the reactor vessel closure studs is performed with the ASME Code Section XI 1998 Edition through 2000 addenda for the third 10-year inspection interval. Volumetric inspection of removed studs is performed.

The staff reviewed USAR, Appendix 3A, "Conformance to NRC Regulatory Guides," and noted the following discussion about the reactor head closure studs' conformance to RG 1.65 :

> Westinghouse follows the recommendations of this regulatory guide, with the following exceptions:
>
> a. The use of modified SA-540, Grade B-24, as specified in the ASME Code (Code Case 1065), is permitted by Westinghouse, but is not listed in this regulatory guide.
>
> b. A maximum ultimate tensile strength of 170 ksi is not specified by Westinghouse, as recommended by this regulatory guide.

Exception "a." above is not considered an issue since Code Case 1605 has been found acceptable to the NRC for application in the construction of components for water-cooled nuclear power plants within the limitations discussed in Regulatory Guide 1.85. The use of Code Case 1605 for reactor vessel closure stud material is not precluded by this regulatory guide.

On the basis that the use of modified SA-540, Grade B-24, for reactor head closure studs is included in the applicant's CLB and the use of this material has been accepted by the staff, as documented in RG 1.85, the staff finds that this deviation from the recommendations of RG 1.65 is an acceptable exception to the GALL Report.

During the audit, the staff requested that the applicant provides additional information to substantiate that the maximum tensile strength of the reactor closure studs and nuts is less than 170 ksi.

In its response, the applicant provided copies of certified material test reports for the WCGS reactor head closure studs, nuts, and washers. The staff reviewed the certified material test reports and confirmed that the WCGS reactor head closure studs, nuts, and washers have a maximum tensile strength less than 170 ksi. Because all WCGS reactor head bolting material has a maximum tensile strength less than 170 ksi, the limit specified in RG 1.65, the staff finds that use of a specification that did not identify a maximum tensile strength for reactor head closure bolting material is an acceptable deviation from the recommendations of RG 1.65 and is an acceptable exception to the GALL Report.

The applicant stated that volumetric inspection (i.e., ultrasonic examination) is performed on reactor head closure studs when they are removed. The applicant identified this as a deviation from RG 1.65 and an exception to the GALL Report because, in addition to volumetric examinations, RG 1.65 recommends performing visual and surface examinations of removed studs while holding them under tension in a tensioning fixture.

The staff reviewed the recommendations of RG 1.65 and the requirements for examination of reactor vessel closure studs in ASME Code Section XI, 2001 Edition with 2002 and 2003 Addenda, referenced in the GALL Report. The staff noted that in the ASME Code Section XI, 2002 Addenda, Table IWB-2500-1, "Examination Category B-G-1, Pressure Retaining Bolting Greater than 2 inches in diameter," a change was made to the requirements for examination of reactor vessel closure studs. Earlier ASME Code editions and addenda had specified volumetric examination for in-place closure studs and had specified volumetric and surface examinations for closure studs when they are removed. However, the ASME Code, Section XI, 2002 Addenda, eliminated separate requirements for in-place and removed studs and implemented a single requirement for volumetric examination that applies for these two cases.

The staff determines that the applicant's examination methodology is consistent with the requirements of the ASME Code Section XI edition and addenda that are referenced in the GALL Report and is adequate to identify potential degradation in the reactor head closure bolts. On this basis, the staff finds that the applicant's use of only volumetric examination for the reactor head closure studs is an acceptable deviation from the recommendations of RG 1.65 and is an acceptable exception to the GALL Report.

The staff reviewed those portions of the Reactor Head Closure Studs Program for which the applicant claims consistency with GALL AMP XI.M3 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Reactor Head Closure Studs Program acceptable because it conforms to the recommended AMP, with the exceptions described.

Operating Experience. LRA Section B2.1.3 states that as part of the ASME Code Section XI Inservice Inspection Program this program is updated to account for industry operating experience. ASME Code Section XI is revised every three years with addenda issued in the interim to update the code to reflect operating experience. The requirement to update the ASME Code Section XI Inservice Inspection Program to most recent editions of ASME Code Section XI at the end of each inspection interval makes the program reflect enhancements from incorporated operating experience. The applicant stated that a review of plant-specific operating experience revealed minor surface discontinuities on reactor vessel stud nuts and washers, and flange stud hole thread damage detected during reactor head closure stud inspections. No cases of cracking have been detected in WCGS reactor vessel studs, nuts, flange stud holes, or washers.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation that is not bounded by industry experience.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Reactor Head Closure Studs Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff did not identify any instances where the applicant's operating experience is outside the envelope of industry experience or where omissions in the applicant's current program resulted in failure to maintain intended functions of components that are within the scope of the program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.3, the applicant provided the USAR supplement for the Reactor Head Closure Studs Program. The staff reviewed this section and determines that the information in the USAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Reactor Head Closure Studs Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.4 Boric Acid Corrosion

Summary of Technical Information in the Application. LRA Section B2.1.4 describes the existing Boric Acid Corrosion Program as consistent, with enhancement, with GALL AMP XI.M10, "Boric Acid Corrosion."

The Boric Acid Corrosion Program manages loss of material due to borated water leakage. The program monitors mechanical, electrical, and structural components within the scope of license renewal susceptible to boric acid corrosion from systems containing reactor coolant or treated borated water. The program relies in part on implementation of recommendations of GL 88-05, "Boric Acid Corrosion of Carbon Steel Reactor Pressure Boundary Components in PWR Plants." Additionally, the program includes examinations during ISI pressure tests in accordance with ASME Code Section XI requirements. The program addresses recent operating experience noted in Regulatory Issue Summary 2003-013, "NRC Review of Responses to Bulletin 2002-01, 'Reactor Pressure Vessel Head Degradation and Reactor Coolant Pressure Boundary Integrity,'" which includes NRC Bulletins 2002-01, 2002-02, and NRC Order EA-03-009. The Boric Acid Corrosion Program detects leakage, examines for evidence of leakage, evaluates it, and initiates corrective actions. The program maintains a tracking and trending program for boric acid leakage from plant components and a component-based visual history of boric acid leakage and/or seepage.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 Boric Acid Corrosion Program (documented in the audit summary), including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M10. The staff questioned the applicant about the inspections of the vessel head for evidence of boric acid.

In its response, the applicant stated that any evidence that boron leakage from above the vessel may have penetrated the mirror insulation shall require a head bare metal inspection for the potentially affected areas to the vessel head, and require cleanup of the head and mirror insulation. The applicant also stated that, in accordance with NRC Order EA-03-009, additional commitments to perform inspections in the RPV closure head have been implemented. These commitments include performing bare metal visual examination of the head surface every third refueling outage or five years, whichever occurs first. The applicant stated that additional information on this subject is included in the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program.

This response is acceptable in providing assurance that the aging management program is adequate relative to boric acid corrosion. This is because the applicant's actions conform with NRC bulletins and orders. In addition the staff's evaluation of Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program is documented in SER Section 3.0.3.2.5.

Enhancement. In the LRA, the applicant credits an enhancement to the GALL Report program element "scope of the program." Specifically, the enhancement states:

> Procedures will be enhanced to state that susceptible components adjacent to potential leakage sources will include electrical components and connectors.

The staff finds that the Boric Acid Corrosion Program states that "The program covers any structures or components on which boric acid corrosion may occur (e.g., steel and aluminum) and electrical components on which borated reactor water may leak." The staff determines that this enhancement is acceptable because the inclusion of electrical components and connectors makes the program consistent with the GALL Report.

The staff reviewed those portions of the Boric Acid Corrosion Program for which the applicant claims consistency with GALL AMP XI.M10 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Boric Acid Corrosion Program acceptable because it conforms to the recommended AMP, with the enhancement described.

Operating Experience. LRA Section B2.1.4 states that industry operating experience indicates that boric acid leakage can cause significant corrosion damage to susceptible plant components. In response to recent NRC generic communications, the RCS pressure boundary integrity walkdowns have been revised to perform periodic visual inspection of the RPV safe-end nozzles, sides, and bottom head, and documentation of any indication of leakage. The applicant stated that a review of plant operating experience revealed instances of boric acid crystals on either the leaking components or the surrounding equipment. Both active leakage and crystal buildup have occurred from packing, bolted connections, or pump seal sources, but it did not cause any loss of intended function due to boric acid corrosion. The applicant stated that leakage effects on nearby components were limited. The Boric Acid Corrosion Program initiates corrective actions upon detection of boric acid crystals or active leakage.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Boric Acid Corrosion Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed selected instances previously documented by the applicant that identified issues with boric acid corrosion and where the applicant had implemented corrective action.

After Refueling Outage 14, a borated water leak was discovered at the high pressure seals at an incore instrument seal table in containment. Pictures were taken on December 2005 and January 2006 at 100 percent power to identify any changes in this leakage. After this outage, the applicant implemented lessons-learned and knowledge transfer actions to ensure seals are installed properly to minimize the probability of leakage at this and similar locations.
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. Therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.4, the applicant provided the USAR supplement for the Boric Acid Corrosion Program. The applicant committed (Commitment No. 1) that, prior to the period of extended operation, procedures will be enhanced to include electrical components and connectors as susceptible components adjacent to potential leakage sources. The staff reviewed this section and determines that the information in the USAR 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 Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancement and confirms that its implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors

Summary of Technical Information in the Application. LRA Section B2.1.5 describes the existing Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program as consistent, with enhancement, with GALL AMP XI.M11A, "Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors."

The Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program manages cracking due to primary water stress corrosion cracking (PWSCC) and loss of material due to boric acid wastage in nickel-alloy vessel head penetration nozzles for the reactor vessel closure head, upper vessel head penetration nozzles, and welds. This program was developed in response to NRC Order EA-03-009. Cracking is detected through a combination of bare metal visual (external surface of head) and nonvisual (underside of head) examination techniques. Procedures are developed for reactor vessel head bare metal inspections and calculations of plant susceptibility ranking. Examinations are performed by Level II or III VT-2 certified personnel. Completed testing to date verifies a susceptibility ranking of "Low" per NRC Order EA-03-009, as amended. Plants in the "Low" category require bare metal visual inspections every third refueling outage or every five years (whichever comes first) and ultrasonic, eddy current, or dye penetrant testing every fourth refueling outage or every seven years (whichever comes first). NDEs (ultrasonic, eddy current, or dye penetrant) of the RPV head penetration nozzles and welds will occur initially during the 2006 refueling outage in accordance with this order.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M11A.

The staff noted that the applicant's implementing procedure for the RPV head bare metal inspection requires an inspection be performed every third refueling outage or every five years, whichever comes first, and that both direct and remote visual techniques may be used. The applicant's procedure for the RPV head NDE examination requires that the examination use ultrasonic, eddy current, or dye penetrant testing and that it be performed every fourth refueling outage or every seven years, whichever comes first. The inspection or examination techniques and frequencies required by the applicant's procedures are consistent with those specified in NRC Order EA-03-009, as amended, as referenced in the GALL Report. The staff noted that the frequencies are applicable for inspection or examination of plants that are in the "low" susceptibility category for PWSCC-related reactor head degradation. It also noted that the applicant's implementing procedures include requirements to determine the susceptibility category for the reactor head using the methodology specified in NRC Order EA-03-009, as amended, and that the reactor head is currently in the "low" susceptibility category.

The applicant identified one enhancement to procedures in the existing Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program.

Enhancement. In the LRA, the applicant credited an enhancement to the GALL Report program element "corrective actions." Specifically, the enhancement states:

> Procedures will be enhanced to indicate that detection of leakage or evidence of cracking in the vessel head penetration nozzles or associated welds will cause an immediate reclassification to the "High" susceptibility ranking, commencing from the same outage in which the leakage or cracking is detected.

The applicant's existing program currently incorporates the requirements for reclassification of susceptibility ranking indirectly, by referencing NRC Order EA-03-009. The enhancement improves the applicant's implementing procedures and provides additional assurance that the requirement will be implemented correctly.

On the basis that a reclassification to the "high" susceptibility category results in more frequent performance of RPV head bare metal inspections and NDE examinations, which is consistent with NRC Order EA-03-009, as amended, and the GALL Report, the staff finds that the applicant's proposed enhancement is acceptable.

The staff reviewed those portions of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program for which the applicant claims consistency with GALL AMP XI.M11A and finds that they are consistent with the GALL AMP. The staff finds the applicant's Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program acceptable because it conforms to the recommended AMP, with the enhancement described.

Operating Experience. LRA Section B2.1.5 states that during a scheduled modification of the control rod drive mechanism (CRDM) cooling shroud, boron residue was detected on the upper surface of the insulation in the vicinity of three CRDMs. The insulation in the affected area was removed and when the vessel head penetrations were examined in October 2003, no evidence of boric acid leakage was detected. The annulus area of the potentially affected penetrations was verified to be free of boric acid. Small accumulations of loose debris were found on the upper side of some penetrations. Loose boric acid crystals on the head surface and transparent boron film on both the penetration sleeves and the head surface were observed. The amount and configuration of the debris and film were compared to as-left conditions from a RPV head bare metal inspection performed in Refueling Outage 12 and were found comparable. The debris was removed and the boron film cleaned. There were no material deficiencies detected on the RPV head or penetration pressure boundaries. There were also no indications of actual or potential leakage through the CRDM penetrations. The boron residue on the head insulation that initiated the examination in accordance with NRC Order EA-03-009, as amended, originated from head vent valve leakage during Operation Cycle 12. Transient event walkdowns in August and October 2004 noted a dry white residue on CRDM penetration P-52 at the lower canopy seal weld. The boron was in the area previously identified with boron accumulation from head vent valve leakage in Refueling Outage 13. The applicant stated that the area was cleaned and a penetrant test found no indication of accumulation.

During the audit, the staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

The staff noted that the applicant had recently performed a bare metal visual examination of the top of the reactor vessel closure head and a non-visual NDE of the nickel-alloy penetration nozzles of the reactor vessel closure head. The staff reviewed the implementing procedures related to these examinations and requested that the applicant provides a summary of examination results.

In its response, the applicant stated that a bare metal visual examination of the top of the reactor vessel closure head meeting the requirements of the revised NRC Order EA-03-009, Section IV.C.(5)(a), as amended, was performed during a refueling outage in October 2006. No evidence of leakage of boron or corrosive products was found. The applicant stated that it also performed a non-visual NDE (i.e., ultrasonic examination) of the nickel-alloy penetration nozzles of the reactor vessel closure head meeting the requirements of the revised NRC Order EA-03-009, Section IV.C.(5)(b). The ultrasonic examination found no indication of cracking in any of the vessel head penetration nozzles.

Based on the applicant's conformance with the requirements of NRC Order EA-03-009, as amended, and as referenced in the GALL Report (relative to aging management), the staff finds the applicant's response acceptable.

The staff reviewed implementing procedures and interviewed selected applicant personnel who have specialized knowledge of the program. The staff did not identify any instances where the applicant's program omitted requirements of NRC Order EA-03-009, as amended, or recommendations of the GALL Report. On this basis, the staff finds that the applicant's implementation of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program is acceptable.

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. Therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.5, the applicant provided the USAR supplement for the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program. The applicant committed (Commitment No. 2) that, prior to the period of extended operation, procedures will be enhanced to ensure that the detection of leakage or evidence of cracking in the vessel head penetration nozzles or associated welds will cause an immediate reclassification to the "high" susceptibility ranking, commencing from the same outage in which the leakage or cracking is detected. The staff reviewed this section and determines that the information in the USAR 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 Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancement and confirms that its implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 Flow-Accelerated Corrosion

Summary of Technical Information in the Application. LRA Section B2.1.6 describes the existing Flow-Accelerated Corrosion Program as consistent, with exception, with GALL AMP XI.M17, "Flow-Accelerated Corrosion."

The Flow-Accelerated Corrosion Program manages aging effects of wall thinning due to flow-accelerated corrosion on the internal surfaces of carbon or low-alloy steel piping, elbows, reducers, expanders, and valve bodies containing high-energy fluids (both single phase and two phases). The program implements the EPRI guidelines in Nuclear Safety Analysis Center (NSAC)-202L, Revision 3 for an effective flow-accelerated corrosion program to detect, measure, monitor, predict, and mitigate wall thinning. To aid in planning inspections and choosing inspection locations, the applicant utilizes the EPRI computer program CHECWORKS developed solely for flow-accelerated corrosion management. The objectives of the Flow-Accelerated Corrosion Program are achieved by (a) identifying system components susceptible to flow-accelerated corrosion, (b) determining by a predictive code like CHECWORKS critical locations for inspection and evaluation, (c) providing guidance for followup inspections, (d) repairing or replacing components as determined by program guidance, and (e) continually evaluating and incorporating the latest technologies and industry and plant-specific operating experience.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remains 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 Flow-Accelerated Corrosion Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M17.

Exception. In the LRA, the applicant credited an exception to the GALL Report program elements "scope of the program" and "detection of aging effects." Specifically, the exception states:

> The WCGS FAC program is in accordance with NSAC-202L-R3, 'Recommendations for an Effective Flow-Accelerated Corrosion Program.' The WCGS FAC program, which adheres to the NSAC-202L-R3 guidance, is consistent with NSAC-202L-R2, for defining the scope of the program and the detection of wall thinning due to Flow-Accelerated Corrosion.

The staff interviewed the applicant's technical personnel and reviewed the scope of NSAC-202L, Revision 3. The staff found that a later revision of NSAC-202L was issued by EPRI to include recommendations updated with the experience feedback received from the members of CHECWORKS Users Group, and to incorporate the recent developments in detection, modeling, and mitigation technology. In the report summary included in NSAC-202L, EPRI stated that the revised recommendations were intended to refine and enhance those provided in the earlier revisions of NSAC-202L, without contradiction, to ensure the continuity of the existing plant flow-accelerated corrosion programs. In addition, the staff reviewed a sampling of the applicant's implementation procedures supporting the objectives of the Flow-Accelerated Corrosion Program.

Based on its review, the staff finds that the exception to the program described above improves the program and; therefore, is acceptable.

The staff reviewed those portions of the Flow-Accelerated Corrosion Program for which the applicant claims consistency with GALL AMP XI.M17 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Flow-Accelerated Corrosion Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.6 states that work orders dated back to 1995 show no reported flow-accelerated corrosion-related leak or rupture. Most of the work orders were for wall thinning found during Flow-Accelerated Corrosion Program inspections. The minimum acceptable thickness has not been violated. Problems detected during program activities had no significant impact on the safe operation of the plant, and adequate corrective actions were taken to prevent recurrence. The applicant stated that industry and plant-specific operating experience and periodic self-assessments are incorporated into the Flow-Accelerated Corrosion Program as necessary.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Flow-Accelerated Corrosion Program and interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the flow-accelerated corrosion and where the applicant had implemented corrective action.

The staff also reviewed a sampling of the work orders and problem identification reports pertinent to the applicant's Flow-Accelerated Corrosion Program. These work orders represent the plant-specific operating experience in detecting and managing the aging effects that result from flow-accelerated corrosion in piping and piping components.

The staff requested that the applicant describe if there have been improvements and/or modifications to the Flow-Accelerated Corrosion Program since it was first implemented. The staff also requested that the applicant explain what actions are taken to ensure that the predicted wear rates performed by the CHECWORKS model are consistent with the actual wear rate

In its response, the applicant stated that WCGS has increased participation in the EPRI CHECWORKS Users Group to better review and respond to issues within the industry. The applicant further stated that in March 2006, WCGS had upgraded its EPRI CHECWORKS program to the later version (i.e., SFA version 2.1) and the model was verified and updated again at this upgrade. Several examples of plant documents were provided by the applicant's technical personnel during the audit that demonstrated the use of the plant and industry experience to carry out flow-accelerated corrosion inspections that led to the detection of wall thinning degradations and subsequent replacement of the piping components.

Based on its review, the staff finds that the applicant's program has been effective in identifying, monitoring, and correcting the effects of flow-accelerated corrosion and can be expected to ensure that piping wall thickness will be maintained above the minimum required by design.

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. Therefore, the staff finds this program element acceptable.

<u>USAR Supplement</u>. In LRA Section A1.6, the applicant provided the USAR supplement for the Flow-Accelerated Corrosion Program. The staff reviewed this section and determines 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 Flow-Accelerated Corrosion Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 Bolting Integrity

<u>Summary of Technical Information in the Application</u>. LRA Section B2.1.7 describes the existing Bolting Integrity Program as consistent, with exceptions, with GALL AMP XI.M18, "Bolting Integrity."

The Bolting Integrity Program manages the aging effects of cracking, loss of material, and loss of preload for pressure-retaining bolting and ASME component support bolting. The program includes preload control, selection of bolting material, use of lubricants and sealants consistent with EPRI bolting practices, and periodic inspections for indications of aging effects. The program also includes ISI requirements in accordance with ASME Code Section XI, Subsections IWB, IWC, IWD, and IWF for ASME Class bolting. WCGS bolting practices are in accordance with plant procedures including requirements for proper disassembly, inspection, and assembly of connections with threaded fasteners. The following AMPs supplement the Bolting Integrity Program with management of loss of preload, cracking, and loss of material: (1) the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program provides the requirements for ISI of ASME Classes 1, 2, and 3 safety-related pressure retaining bolting, (2) the ASME Code Section XI, Subsection IWF Program provides the requirements for ISI of safety-related component support bolting, and (3) the External Surfaces Monitoring Program provides the requirements for the inspection of pressure boundary closure bolting within the scope of license renewal.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains 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 Bolting Integrity Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M18.

The staff requested that the applicant clarify if they use a bolting expert in accordance with EPRI recommendations. In its response, the applicant stated that while EPRI identifies a bolting coordinator as an individual who has technical ability and authority to focus on both programmatic issues and day-to-day resolution of problems, the mechanical design engineering group provides the functions of the bolting coordinator which is consistent with the EPRI guidance.

The staff finds the applicant's response acceptable because it explained that the mechanical design engineering group performs the functions recommended in the EPRI guidance.

The staff requested that the applicant explain if the WCGS fasteners are being inspected in place. If not, the staff requested that the applicant clarify if WCGS requested relief from the ASME Code, Section XI, requirements.

In its response, the applicant stated that the statement in the operating experience implying that this is an ASME Code Section XI inspection is incorrect. The inspection was required in response to NRC Bulletin 82-02, which states that ASME Code, Section XI, acceptance criteria should be utilized. The Bulletin also states that fasteners which were seized or interference fit could be inspected in place. This indicates that either excessive force would be required to remove the fastener (i.e., seized) or the fastener was designed to be difficult to remove or back out (i.e., interference fit). In either case, this allowance is technically justified when considering that a borated water path into the fastener threads would have to begin at an exposed surface. Also, the applicant stated that boric acid corrosion needs oxygen, which also is not present in sufficient quantities internal to a seized fastener. Both the borated water path and oxygen supply would be present at the exposed surface of the fastener. Therefore, the Bulletin was correct in allowing such fasteners to be inspected in place. The applicant stated that based on these arguments, seized or interference fit fasteners are inspected in place, and no ASME Code relief is required.

The staff finds the applicant's response acceptable because the seized or interference fit fasteners are inspected in place and the inspections are not ASME Code requirements; therefore, relief from ASME Code requirements are not needed.

The staff requested that the applicant describe the maintenance procedures used to check bolt torque and the uniformity of gasket compression. The staff also requested that the applicant provides the frequency for the maintenance activity.

In its response, the applicant stated that, in accordance with plant procedures on bolting installations, proper bolting practice to provide leak tight pressure retaining joints includes: (1) pre-assembly inspection and cleaning requirements, (2) use of specific bolting torquing patterns, (3) increased application of torque through multiple passes, and (4) verification of uniformity of the gasket compression. Post-bolting inspections include verifying contact between the fastener and flange and proper flange alignment. The applicant stated that guidance for proper preload is provided with desired torque values to ensure adequate gasket stress for leak tightness.

These activities are performed when there are opportunities of removal and installation of the subject components for maintenance or scheduled inspections.

The staff finds the applicant's response acceptable because it clarifies that WCGS has qualified procedures for torquing bolts and for assuring uniformity of gasket compression.

Exception 1. In the LRA, the applicant credited an exception to the GALL Report program element "scope of the program." Specifically, the exception stated:

> NUREG-1801, Section XI.M18 specifies the use of ASME Section XI 1995 edition with the 1996 addenda. WCGS uses the ASME Section XI, 1998 Edition through 2000 addenda for the current third interval ISI Program. Use of the 1998 Code through 2000 addenda does not change the requirements regarding inspections, evaluations and corrective actions for safety-related bolting to ensure the integrity of the intended functions.

The staff finds that this exception is acceptable because the use of this ASME Code edition and addenda for the current interval has been approved by the staff and the requirements in the different editions have not changed.

Exception 2. In the LRA, the applicant credited an exception to the GALL Report program elements "scope of the program," and "preventive actions." Specifically, the exception stated:

> The procedures for ensuring bolting integrity identify preload requirements and general practices for in-scope bolting but do not directly reference EPRI NP-5769 or NUREG-1339 as applicable source documents for these

> recommendations. However, these procedures do reference and incorporate the good bolting practices identified in EPRI NP-5067 and EPRI TR-104213. EPRI NP-5769 and NUREG-1339 are very closely related with EPRI NP-5067 and EPRI TR-104213 and they cross-reference one another. EPRI NP-5769, Section 8, Good Bolting Practices, refers to EPRI NP-5067 for the identification of bolting practices associated with disassembly and assembly of bolted joints, and the methods for minimizing bolted joint problems such as leaks, vibration loosening, fatigue, and stress corrosion cracking. Implementation of the recommendations in EPRI NP-5067 and EPRI TR-104213 is considered to be consistent with the recommendations in EPRI NP-5769 and NUREG-1339 to meet the NUREG-1801 recommendations.

The staff finds this exception acceptable because the EPRI recommendations followed by the applicant are consistent with the recommendations provided in the GALL Report.

Exception 3. In the LRA, the applicant credited an exception to the GALL Report program element "parameters monitored or inspected." Specifically, the exception stated:

> Loss of preload is not a parameter of inspection for the WCGS Bolting Integrity Program. EPRI NP-5769, Volume 2, Section 10, indicates that job inspection torque is non-conservative since, for a given fastener tension, more torque is required to restart the installed bolts. The techniques for measuring the amount of bolt tension in an assembled joint are both difficult and unreliable. EPRI NP-5769, Volume 2, Section 10, suggests that inspection of preload is usually unnecessary if the installation method has been carefully followed. Torque values provided in the procedures are based on criteria of stretch to cover the expected relaxation of the fasteners over the life of the joint. Gasket stress is also considered for pressure boundary closure bolting.

During the audit, the staff requested that the applicant describe the maintenance procedures used to check bolt torque and the uniformity of gasket compression. In its response, the applicant stated that, in accordance with plant procedures on bolting installations, proper bolting practice to provide leak tight pressure retaining joints includes: (1) pre-assembly inspection and cleaning requirements, (2) use of specific bolting torque patterns, (3) increased application of torque through multiple passes, and (4) verification of uniformity of the gasket compression. Post-bolting inspections include verifying contact between the fastener and flange and proper flange alignment. Guidance for proper preload is provided with desired torque values to ensure adequate gasket stress for leak tightness.

The staff finds the applicant's response acceptable because WCGS is following EPRI guidelines that have been developed by the industry. These EPRI guidelines are consistent with the Bolting Integrity Program as described in the GALL Report.

Exception 4. In the LRA, the applicant credited an exception to the GALL Report program element "monitoring and trending." Specifically, the exception stated:

> NUREG-1801, Section XI.M18, specifies that if bolting connections for pressure retaining components (not covered by ASME Section XI) are reported to be leaking, then they may be inspected daily. If the leak rate does not increase, the

inspection frequency may be decreased to biweekly or weekly. WCGS procedures require the inspection frequency be adjusted as necessary based on the trending of inspection results to ensure there is not a loss of intended function between inspection intervals. For pressure retaining components reported to be leaking, the site corrective action process is initiated. Consideration is also given to adequate frequency of subsequent inspections to ensure the inspection interval is adequate to detect further aging degradation so that a loss of intended function is avoided.

The staff finds that this exception is acceptable because it is more restrictive than the recommendations provided in the GALL Report.

The staff reviewed those portions of the Bolting Integrity Program for which the applicant claims consistency with GALL AMP XI.M18, and finds that they are consistent with the GALL AMP. The staff finds that the applicant's Bolting Integrity Program is acceptable because it conforms to the recommended AMP, with the exceptions described.

Operating Experience. LRA Section B2.1.7 states that a review of plant-specific operating experience found issues with corrosion, missing or loose bolts, inadequate thread engagement, and improper bolt applications. There is no reported cracking of the bolts due to SCC. The applicant stated that all concerns were corrected, no significant safety event occurred, and additional actions like procedural enhancements were implemented as needed to prevent recurrence.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Bolting Integrity Program for programmatic issues relevant to license renewal review. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed selected instances previously documented by the applicant that identified issues with bolting and where the applicant had implemented corrective action.

During the audit, the staff noted that a valve (in one operating experience example) was found to have external corrosion (relative to programmatic issues associated with corrective action program). Some of the corrosion had affected the threads on the bolts. A work order was written to replace two of the bolts. The staff finds that the corrective actions taken by the applicant are acceptable because the bolts were adequately replaced.

While reviewing the problem identification reports, the staff noted that the studs on a leaking bonnet flange were found to be overtorqued at 355 ft-lb. A plan of action was developed to replace the studs, one at a time, and the cover during a refueling outage, if needed. The staff's concern is that this problem was not identified in a corrective work package. The purpose of this report was only to identify the issue. The operability of the valve was not a concern because the valve and the nonsafety-related service loop in the component cooling water system (CCWS) can be isolated. In addition, the studs may have been yielded, but were not taken to the ultimate tensile strength of the studs.

The staff believes that the studs will keep the bonnet cover in place based on the past service of the component and the fact that the studs are currently torqued to a lower value according to plant procedures.

The staff also noted that work instructions were issued for correcting an oil leak at the gaskets between a lube oil pump casing, rotor, and end cover housing. While disassembly the pump end cover housing, it was noted that four bolts which tighten the pump housing gaskets were loose. The bolts in question were less than snug tight. WCGS determined that this was the cause of the leakage.

The staff believes that in all likelihood, tightening the four bolts could have stopped the leakage. The work of developing work package instructions, scheduling, and implementing of this activity might well have been precluded had the cause for the oil leak been more closely examined.

In the Boric Acid Corrosion Program, the applicant stated that WCGS is treating fasteners that are difficult to remove for engaged thread inspection as "seized" to prevent backing out. This practice is based on guidance provided in NRC IE Bulletin 82-02, which states "Fasteners "seized" or designed with interference fit may be inspected in place." As a result, the engaged threads of certain stuck fasteners designed as removable, but are difficult to remove, are not being inspected as required by ASME Code, Section XI.

The staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated to provide objective evidence to support the conclusion that the aging effects are adequately managed.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.7, the applicant provided the USAR supplement for the Bolting Integrity. The staff reviewed this section and determines that the information in the USAR 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 Bolting Integrity, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Steam Generator Tube Integrity

Summary of Technical Information in the Application. LRA Section B2.1.8 describes the existing Steam Generator Tube Integrity Program as consistent, with exceptions, with GALL AMP XI.M19, "Steam Generator Tube Integrity."

The scope of the Steam Generator Tube Integrity Program includes the preventive measures, condition monitoring inspections, degradation assessments, and repair and leakage monitoring activities necessary to manage cracking, loss of material, denting, and wall thinning. The aging management measures include NDE examination, visual inspection, sludge removal, tube plugging, *in-situ* pressure testing, and chemical environmental maintenance by removal of impurities and addition of chemicals to control pH and oxygen. NDE inspection scope and frequency and primary to secondary leak rate monitoring are consistent with the requirements of WCGS Technical Specifications. Structural integrity limits consistent with RG 1.121, Revision 0, "Bases for Plugging Degraded PWR Steam Generator Tubes," are applied.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains 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 Steam Generator Tube Integrity Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M19.

During the audit and review, the staff requested that the applicant clarify how many tubes are plugged in each steam generator, and if WCGS has plans to replace these steam generators. In its response, the applicant stated that less than 1 percent are plugged in steam generators A, B, and C, and about 2 percent in steam generator D. The applicant stated that the current economic model for steam generators does not recommend replacement. The model is updated as the conditions change. The applicant clarified that the steam generator tubes are made from Alloy 600 thermally treated, which are much more resistant to degradation compared to Alloy 600 mill annealed tubes.

Exception. In the LRA, the applicant credited an exception to the GALL Report program element "scope of the program." Specifically, the exception states:

> When in wet layup conditions, WCGS is meeting the requirements for mixing of the steam generator bulk solution and ensuring adequate sample line flush times are employed. This ensures the chemistry of the bulk fluid is uniform and that samples are representative of the bulk steam generator secondary side water. The WCGS design incorporates pumps for periodic recirculation of the steam generator fluid. Operating experience has shown that a 33-hour recirculation period will provide adequate bulk mixing. If sample results after 33 hours of recirculation indicate a failure to meet the layup specifications, corrective action is taken to correct the layup mixture.

The staff requested that the applicant confirm if there was an analysis that states that a 33-hour recirculation of steam generators followed by weekly sampling is better than or equivalent to obtaining three samples per week until values are stable when in wet layup conditions.

In its response, the applicant stated that this exception was taken based on operating experience and history. Prior to initial fill of the steam generators during plant construction, calculations were performed to determine the required recirculation time to achieve mixing of the bulk solution. This calculation was based on the steam generator volume, flow-rate of the mix pumps, and recirculating three volumes of the bulk solution. The result was that a 33-hour recirculation time would thoroughly mix the bulk solution. The use of the 33-hour mix time became a standard practice. Once in wet layup with chemicals added, the steam generators are mixed for 33 hours and then sampled to analyze the desired chemical environment. Then, recirculation and sampling are done on a weekly basis, in accordance with plant procedures. The applicant stated that experience has shown that once the steam generators bulk solution meets the required specifications, it remains satisfactory. If the parameters set forth in the plant procedures are not met, adjustments are taken and the recirculation and sampling is repeated.

The staff noted from the license renewal program evaluation report that the WCGS design incorporates pumps for recirculation of the steam generator fluid. The staff also finds that the applicant performed calculations based on the steam generator volume, flow-rate of the mix pumps, and recirculating three volumes of the bulk solution. On the basis that the applicant provided an analytical basis for the 33-hour mix time, the staff finds this exception acceptable.

The staff reviewed LRA Section B2.1.8 and identified areas in which additional information was necessary to complete the review of the applicant's aging management program. The applicant responded to the staff's RAIs as discussed below.

The staff noted that the GALL Report states, in part, that the degradation management program in NEI 97-06, "Steam Generator Tube Integrity," is adequate to manage the effects of aging of the steam generator tubes. NEI 97-06 references guideline documents developed by EPRI for managing areas important to steam generator tube integrity, including tube inspections. The LRA discusses several exceptions taken to these EPRI guidelines.

In RAI B2.1.8-1 dated September 27, 2007, the staff noted that the LRA states that the rotating pancake probe is used to inspect from 3 inches above to 3 inches below the top of the tubesheet and that the bobbin probe is used to inspect the entire engagement length of the hydraulically expanded tubesheet region. However, the bobbin probe is not qualified for inspection in this area. The application also states that there was a one-cycle license amendment request to use an alternate tube repair criteria which, in part, eliminated the need to inspect near the tube ends on the hot-leg side of the steam generator.

The staff noted that the EPRI guidelines indicate that the full length of the steam generator tubes requires an inspection with an inspection technique qualified for each region of the tube.

The staff requested that the applicant clarify this exception to the GALL Report and the EPRI guidelines. The staff requested that the applicant clarify whether the exception being taken to the EPRI guidelines is that the entire tube is not inspected or whether WCGS is not inspecting the portions of the tube that require inspection with techniques capable of detecting flaws that may occur in that region. The staff noted that the tube requires inspection with the objective of detecting flaws of any type, and that may satisfy the applicable tube repair criteria, as described in the WCGS technical specification 5.5.9.d. If cracking of the tube could occur at various locations within the tubesheet, these areas should be inspected with techniques capable of finding these flaws (and consistent with the sampling and tube integrity requirements of the technical specifications).

In its response, dated October 17, 2007, the applicant stated that this issue is no longer considered as an exception to the GALL Report. NEI 97-06 and the associated EPRI guidelines are established to perform degradation assessments and condition monitoring and operational assessments to ensure steam generator tube integrity. The applicant stated that since the LRA was submitted, WCGS implemented its operating license amendment 164 to revise various technical specifications associated with steam generator tube integrity to adopt TSTF-449, Revision 4, "Steam Generator Tube Integrity." Currently, WCGS is in compliance its technical specification 5.5.9.d.

The staff finds the applicant's response to RAI B2.1.8-1 acceptable because it explained that this is no longer an exception to the GALL Report. Further, it clarified that WCGS is in compliance with its technical specification 5.5.9.d. Therefore, the staff's concern described in RAI B2.1.8-1 is resolved.

In RAI B2.1.8-2 dated September 27, 2007, the staff noted that the LRA states that the bobbin probe is used to detect PWSCC at tube dents in support plates and SCC in free span regions. However, the bobbin probe is not qualified for detection of these degradation mechanisms when the voltage of the dent exceeds certain threshold values. Further, the staff noted that the EPRI guidelines indicate that the full length of the steam generator tubes requires an inspection with an inspection technique qualified for each region of the tube.

The staff requested that the applicant clarify the nature of this exception to the GALL Report and EPRI guidelines since the WCGS technical specifications require, in part, to (a) perform an assessment of the type and location of flaws to which the tubes may be susceptible and, based on this assessment, to determine which inspection methods need to be employed and at what locations, and (b) inspect the tubes with the objective of detecting flaws that may satisfy the applicable tube repair criteria.

The staff noted that in light of these requirements, if WCGS concludes that PWSCC could occur at tube dents in support plates or outer diameter SCC could occur in free span regions, these regions should be inspected with techniques capable of finding these forms of degradation.

In its response, dated October 17, 2007, the applicant stated that this issue is no longer considered to be an exception to the GALL Report. NEI 97-06 and the associated EPRI guidelines are established to perform degradation assessments and condition monitoring and operational assessments to ensure steam generator tube integrity. The applicant stated that since the LRA was submitted, WCGS implemented its operating license amendment 164 to revise various technical specifications associated with steam generator tube integrity to adopt TSTF-449, Revision 4. Currently, WCGS is in compliance its technical specification 5.5.9.d.

The staff finds the applicant's response to RAI B2.1.8-2 acceptable because it explained that this is no longer an exception to the GALL Report. Further, it clarified that WCGS is in compliance with its technical specification 5.5.9.d. Therefore, the staff's concern described in RAI B2.1.8-2 is resolved.

In RAI B2.1.8-3 dated September 27, 2007, the staff noted that the LRA indicates that the EPRI guidelines require that if active damage mechanisms are identified then all steam generators shall be examined at the end of each fuel cycle. The application also states that although

WCGS currently has one active damage mechanism (i.e., wear at anti-vibration bars), only two steam generators are inspected at each refueling outage on an alternating basis so that each steam generator is examined every other refueling outage.

The staff requested that the applicant confirm that WCGS has verified the acceptability of this approach at each outage by confirming that tube integrity will be maintained for the period of time between the planned inspections of the steam generators, consistent with the WCGS technical specification requirements.

In its response, dated October 17, 2007, the applicant stated that this issue is no longer considered to be an exception to the GALL Report. NEI 97-06 and the associated EPRI guidelines are established to perform degradation assessments and condition monitoring and operational assessments to ensure steam generator tube integrity. The applicant stated that in accordance with these requirements, the condition monitoring evaluation is performed to compare the observed tube eddy current indication parameters against structural and leakage integrity limits that are included in the pre-outage degradation assessment. An operational assessment is also performed to project the inspection results and trends to the next inspections, and to provide reasonable assurance that the structural and leakage requirements will continue to be met during the planned operating interval. These evaluations are conducted as required during each inspection.

The staff finds the applicant's response to RAI B2.1.8-3 acceptable because it explained that this is no longer an exception to the GALL Report. Further, it explained that a condition monitoring evaluation and an operational assessment are performed to provide reasonable assurance that the leakage requirements are met. Therefore, the staff's concern described in RAI B2.1.8-3 is resolved.

By letter dated October 17, 2007, the applicant amended LRA Section B2.1.8 to delete three of the four exceptions to the GALL Report originally credited in the application. The staff finds that this is acceptable. The staff finds that WCGS is in compliance with its technical specifications and is not taking exceptions to the recommended EPRI guidelines; therefore, these three items should not be considered as exceptions to the GALL Report. Further, as previously discussed, the only exception credited by the applicant (i.e., steam generators mixing solution), has been found acceptable by the staff.

The staff reviewed those portions of the Steam Generator Tube Integrity Program for which the applicant claims consistency with GALL AMP XI.M19 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Steam Generator Tube Integrity Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.8 states that the Steam Generator Tube Integrity Program has been developed to be consistent (with the minor exceptions noted) with NEI 97-06, "Steam Generator Program Guidelines," and to benefit from industry operating experience available when the initiative was issued as well as from the EPRI guidelines it endorses. The applicant stated that procedures require a steam generator degradation assessment update every operating cycle to incorporate the latest industry and plant-specific operating experience with steam generator degradation mechanisms.

GL 95-05 addresses issues related to alternate repair criteria. The applicant stated that a one-time license amendment request for alternate repair criteria (B*) was approved for Refueling Outage 14 and the subsequent operating cycle. Tube sleeves are not approved for use at WCGS, and therefore, are not used.

The applicant evaluates industry and plant-specific operating experience to identify active, relevant, and potential tube damage mechanisms as addressed in NRC IN 97-88.

WCGS is a four-loop Westinghouse plant with four identical Model F steam generators. After Refueling Outage 14 in the spring of 2005, 181 tubes had been plugged, which consists of less than 1 percent of the total number of tubes. The applicant determined that the plugging was caused by manufacturing issues, anti-vibration bar wear, loose part wear, tube support wear (most likely due to a trapped loose part), flow distribution baffle wear (due to pressure pulse cleaning), and preventive measures (manufacturing anomalies discovered in the field). As of the end of Refueling Outage 14, no corrosion degradation was detected in any steam generator tubes. The applicant stated that wear due to anti-vibration bars and loose parts is the only active effect observed in the steam generators.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Steam Generator Tube Integrity Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed selected instances previously documented by the applicant that identified issues with steam generator tube integrity and where the applicant had implemented corrective action.

The NRC IN 2005-09 addresses recent operating experience with degradation in steam generator tubes and tube-to-tube sheet welds. In the United States, only a few cracks, or crack-like defects, have been detected in steam generator tubes fabricated from thermally treated Alloy 600. Prior to 2004, most, if not all, of these indications occurred at two plants and were attributed to non-optimal tube processing.

The staff determines that the findings at Catawba Nuclear Station, Unit 2, are noteworthy (relevant and applicable to WCGS which is also a PWR) because they indicate that degradation can occur at various locations within the tubesheet region of thermally treated Alloy 600 tubes. Crack-like indications were first found in manufacturing anomalies (e.g., bulges or tubesheets anomalies) rather than at tube locations with short-bend radii like the expansion transition on the hot-leg side and the u-bend region. Inspections at Catawba, Unit 2, focused on these areas due to high operating temperatures and residual stress in these regions. The staff believes that recent operating experience at Catawba, Unit 2, shows the importance of monitoring all tube locations, such as bulges, dents, and dings, with techniques capable of finding potential forms of degradation that may be occurring at these locations, as described in GL 2004-001, "Requirements for Steam Generator Tube Inspections." The Catawba, Unit 2, experience also highlights the need to inspect all regions with high residual stress. Such inspections will provide added assurance that any degradation at these locations will be promptly detected.

The staff also noted that thermally treated Alloy 600 or Alloy 690 tubing steam generator leaks at H. B. Robinson, Palo Verde, and Shearon Harris nuclear power plants also show the need for thorough inspections and robust ISI programs regardless of tube material or steam generator history.

Given the industry operating history with steam generator tube leaks, the staff was concerned because it seemed that the Steam Generator Inspection Program was using techniques that are not consistent with the staff position, EPRI guidance, and the recommendations in the GALL Report. However, in its letter dated October 17, 2007, the applicant clarified that WCGS is following the recommendations in the EPRI guidance and is no longer taking exceptions to the GALL Report.

In its letter, the applicant amended LRA Section B2.1.8 and clarified that an operating license amendment allowed WCGS to use alternate repair criteria (B*) during Refueling Outages 14 and 15 and the subsequent operating cycles following these outages. The applicant also clarified that after Refueling Outage 15, 204 tubes have been plugged, which consists of less than 1 percent of the total number of tubes. It also clarified that no corrosion degradation has been detected in any steam generator tubes.

The staff finds that the steam generator tube inspection findings at WCGS are consistent with the inspection findings at other similarly designed and operated steam generators. In addition, its Steam Generator Inspection Program is similar to that employed at other PWRs. The staff determines that these programs have been effective at incorporating operating experience into their steam generator programs.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.8, the applicant provided the USAR supplement for the Steam Generator Tube Integrity.

In RAI B2.1.8-4 dated September 27, 2007, the staff noted that the description provided in the LRA and the USAR supplement states that structural integrity limits consistent with RG 1.121, "Bases for Plugging Degraded PWR Steam Generator Tubes," are applied as part of the Steam Generator Tube Integrity Program. The staff requested that the applicant confirm that the AMP also includes the structural integrity limits contained within the WCGS technical specifications.

The applicant, in its response dated October 17, 2007, stated that since the LRA was submitted, WCGS implemented its operating license amendment 164 to revise various technical specifications associated with steam generator tube integrity to adopt TSTF-449, Revision 4. Currently, WCGS is in compliance its plant technical specifications.

The applicant amended LRA Sections B2.1.8 and A1.8 and in addition, clarified that NDE inspection scope and frequency, and primary to secondary leak rate monitoring are conducted consistent with the requirements of the plant's technical specifications. The applicant also clarified that the structural integrity limits are consistent with RG 1.121, Revision 0 and that plant's steam generator management practices are consistent with NEI 97-06, without exceptions.

The staff reviewed this section and determines that the information in the USAR 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 Tube Integrity, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and its 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 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 Closed-Cycle Cooling Water System

Summary of Technical Information in the Application. LRA Section B2.1.10 describes the exiting Closed-Cycle Cooling Water System Program as consistent, with exception and enhancement, with GALL AMP XI.M21, "Closed-Cycle Cooling Water System."

The Closed-Cycle Cooling Water System Program manages loss of material, cracking, and reduction of heat transfer for components in closed-cycle cooling water systems. The program *includes maintenance of system corrosion inhibitor concentrations within specified* EPRI TR-107396 limits to minimize aging and periodic testing and inspections to evaluate system and component performance. Inspection methods include visual, UT, and eddy current testing. For the CCWS, through the addition of corrosion inhibitors and biocides, the program maintains water chemistry within the parameters specified in plant procedures to minimize corrosion and microbiological growth. Diagnostic chemistry parameters are monitored to maintain the water within specified parameters and indicate abnormal conditions. Performance of selected heat exchangers is monitored by surveillance testing of the thermal or hydraulic function. The system pumps are also tested for performance. NDEs verify maintenance of the pressure boundary intended function of system components. The program requires system pressure tests to find leaks so corrective actions can be taken. For the emergency diesel engine cooling water subsystem, plant heating system, and central chilled water system, the program relies on mitigative measures to minimize corrosion and microbiological growth with corrosion inhibitors and biocides. Chemistry parameters also are monitored for abnormal conditions to preclude cracking in stainless steel in the plant heating system. Emergency Diesel generator (DG) engine performance parameters are monitored through periodic surveillance tests. The plant heating and central chilled water systems are within the scope of license renewal for spatial interaction concerns only; therefore, the periodic sampling and maintenance of system chemistry in accordance with specified limits is adequate assurance that component *intended functions are maintained.*

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception and enhancement to determine whether the AMP, with the exception and enhancement, 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 Closed-Cycle Cooling Water Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M21.

Exception 1. In the LRA, the applicant credited an exception to the GALL Report program element "parameters monitored or inspected." Specifically, the exception stated:

> NUREG-1801, Section XI.M21 states this program should monitor heat exchanger parameters including flow, inlet and outlet temperatures, and differential pressure. The letdown heat exchangers, residual heat removal heat exchangers, safety injection pump coolers, and the PASS sample coolers, are not periodically tested for flow, inlet and outlet temperatures, and differential pressure. The CCW heat exchangers are periodically tested to measure heat transfer capability. Shell-side (closed-cycle cooling water) flow and temperature measurements are used to calculate heat exchanger performance in terms of a fouling factor. Tube side (raw water) flow and differential pressure are also measured and used as an indicator of tube fouling. The CCW heat exchangers are periodically NDE-tested (ECT) to detect aging of the tube pressure boundary. The performance monitoring and NDE of the CCW heat exchangers will provide a leading indicator for aging of the other CCW supplied heat exchangers. An enhancement to the WCGS closed-cycle cooling water system program to specify inspection of the internal surfaces of the CCW pump return line check valves during operational readiness inspection activities will also provide additional indicators of the effective aging management of loss of material and fouling in the CCW system. A review of WCGS plant-specific operating experience indicates there has been no evidence of significant fouling or loss of material observed in the closed cooling water systems. In lieu of performance testing of all CCW supplied heat exchangers, the CCW heat exchanger performance monitoring, system internal inspections activities, and CCW chemistry program are used to manage aging effects in the CCW system.

The staff noted that in lieu of monitoring heat exchanger parameters such as flow, inlet and outlet temperatures and differential pressures, the applicant periodically tests the component cooling water heat exchangers to measure heat transfer capability. The heat exchangers are also periodically tested with NDE to detect aging of the tube pressure boundary. The applicant has proposed an enhancement to inspect internal surfaces of check valves in the CCWS pump return lines during ISI activities.

The staff determines that the performance monitoring of the heat exchangers, the NDE inspection of heat exchanger tubes, and the inspection of internal surfaces of check valves will provide a leading indicator that aging resulting in a loss of material and fouling of heat exchangers is adequately managed in the closed cycle cooling water system. The staff also reviewed the operating experience and determines that there has been no evidence of significant fouling or loss of materials in the CCWS. On the basis of its review, the staff finds the exception acceptable.

The GALL AMP XI.M21 program description states that the program includes preventive measures to minimize corrosion, and testing and inspection to monitor the effects of corrosion on the intended function of the component.

During the audit, the staff reviewed the license renewal program evaluation report for the Closed-Cycle Cooling Water System Program and found that in elements "parameters monitored or inspected" and "detection of aging effects," the applicant stated that for the plant heating steam and central chilled water systems, inspection is not performed; only periodic sampling and maintenance of water chemistry within specified limits is adequate to manage aging. The staff requested that the applicant justify why this is not considered an exception to the GALL Report.

In its response, the applicant stated that it agreed with the staff and that this is an exception to the GALL Report. By letter dated August 31, 2007, the applicant amended LRA Section B2.1.10 to include exception as discussed below.

Exception 2. In the LRA amendment, the applicant credited an exception to the GALL Report program elements "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria." Specifically, the exception stated:

> WCGS will not perform inspection or testing of plant heating and central chilled water systems. Plant heating and central chilled water systems are in the scope of license renewal due to 10CFR50.54(a)(2) due to spatial interactions only. Therefore, the only intended function applicable to these systems is pressure boundary. Crud buildup would not directly affect the intended function of these components. The periodic sampling and maintenance of system chemistry within specified limits is adequate to manage aging before the loss of intended function.

During the audit, the staff verified that the applicant maintains the system corrosion inhibitor concentrations within the limits specified by EPRI TR-107396, "Closed-Cooling Water Chemistry Guidelines," to minimize aging. The staff reviewed the operating experience for systems and components that have an internal environment of closed cycle cooling water and have had inspections performed, and found that there has been no evidence of significant loss of materials in the system. Since plant heating and central chilled water systems are within the scope of license renewal pursuant to 10 CFR 50.54(a)(2) for spatial interactions, and the only intended function applicable to these systems is pressure boundary, the staff finds that the periodic sampling and maintenance of system chemistry within specified limits is adequate to manage aging before the loss of intended function. On the basis of its review, the staff finds the exception acceptable.

Enhancement 1. In the LRA, the applicant credited an enhancement to the GALL Report program element "monitoring and trending." Specifically, the enhancement stated:

> A new periodic preventive maintenance activity will be developed to specify performing inspections of the internal surfaces of the valve bodies and accessible piping while the valves are disassembled for operational readiness inspections to detect loss of material and fouling.

During the audit, the staff noted that although the "monitoring and trending" program element is enhanced to include performing inspections, the "acceptance criteria" program element was not enhanced to provide an acceptance criteria for these inspections. The staff requested that the applicant explain where the acceptance criteria for these new inspections will be provided.

In its response, the applicant stated that the acceptance criteria will be specified within the preventive maintenance activities. By letter dated August 31, 2007, the applicant amended the enhancement in LRA Section B2.1.10 to state:

> A new periodic preventive maintenance activity will be developed to specify performing inspections of the internal surfaces of the valve bodies and accessible piping while the valves are disassembled for operational readiness inspections to detect loss of material and fouling. The acceptance criteria will be specified in this preventive maintenance activity.

The staff finds that this enhancement specifies performing periodic inspections of check valve internals as part of a new preventive maintenance activity and provides acceptance criteria for these inspections. The staff finds this enhancement acceptable because it provides further verification of the effectiveness of the closed cycle cooling water chemistry and will make the Closed-Cycle Cooling Water System Program consistent with the program description in the GALL Report, which includes inspection to monitor the effects of corrosion.

During the audit, the staff found that one of the implementing procedures used for visual inspection did not clearly state how the use of this procedure will manage cracking. The staff requested that the applicant clarify how cracking will be managed.

In its response, the applicant stated that the procedure will be revised to clearly define the term cracking and to provide further guidance. By letter dated August 31, 2007, the applicant amended LRA Section B2.1.10 to add the following enhancement:

<u>Enhancement</u> 2. In the LRA amendment, the applicant credited an enhancement to the GALL Report program element "detection of aging effects." Specifically, the enhancement stated:

> Visual inspection procedures used for identification of stress corrosion cracking (SCC) will be enhanced to define cracking, provide additional guidance for detection of cracking and identify specific acceptance criteria relating to "as-found" cracking.

The staff finds this enhancement acceptable because it provides information on how cracking is defined and identified, and provides specific acceptance criteria for "as-found" cracking.

The staff reviewed those portions of the Closed-Cycle Cooling Water Program for which the applicant claims consistency with GALL AMP XI.M21 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Closed-Cycle Cooling Water Program acceptable because it conforms to the recommended AMP, with exceptions and enhancements described.

<u>Operating Experience</u>. LRA Section B2.1.10 states that the applicant has identified biological activity and deposit build-up in the closed cycle cooling water systems. The LRA also states that through-wall leakage was observed at welds in the closed cycle cooling water return line, and rejectable linear indications were found in letdown heat exchanger discharge piping and in the reactor coolant pump (RCP) closed cycle cooling water discharge piping. The cause was identified as SCC. Based on the results of the UT examinations, repair plans were developed to replace all welds with rejectable indications. Piping was replaced, as necessary, to facilitate

fieldwork and to limit radiation exposure. Welds inside the heat exchanger room were not inspected because of the dose rates. However, all these welds and piping were replaced.

The applicant contracted with various outside agencies to perform hardware failure analysis and inspections. The staff also contracted an outside agency to perform further analysis. The final reports from both organizations were provided to the staff and WCGS for their review. The investigations performed by the applicant's contractor revealed no significant SCC in the circumferential direction. However, small amounts (degree and instances) of SCC in the longitudinal direction were found. The deterioration was limited to a few very small areas and was characterized as intergranular attack. No cracking was observed in the analyses performed by the staff's contractor.

The LRA states that, based on conclusions and recommendations of the various reports and analyses of cracking in the closed cycle cooling water system piping, plant's corrective actions included (1) adjustment of pH and molybdate to the higher levels in EPRI guidelines, (2) monitoring of biological activities and adding biocides, (3) replacement and stress relief of susceptible welds, and (4) revision of plant-specific UT inspection procedures to incorporate EPRI recommendations. The staff concluded that, based on the applicant's information and the work performed by the staff's contractor, WCGS has taken sufficient corrective action and no additional action was needed.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Closed-Cycle Cooling Water System Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the water chemistry and where the applicant had implemented corrective action.

The staff noted that outside agencies had performed an assessment of the applicant's Closed-Cycle Cooling Water Program and the applicant has taken appropriate corrective actions to modify the program to meet acceptable standards. The staff also verified that the applicant has implemented appropriate and timely corrective actions for resolving age-related degradation issues. The applicant is following the EPRI guidelines, which provide the limits on contaminants and recommends an inspection program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.10, the applicant provided the USAR supplement for the Closed-Cycle Cooling Water System Program. The applicant committed (Commitment No. 3) to develop a new periodic preventive maintenance activity to include inspections of internal surfaces of valve bodies and accessible piping to detect loss of material and fouling. By letter dated May 25, 2007, the applicant modified this commitment to specify that acceptance criteria will be added to this preventive maintenance activity. By letter dated May 25, 2007, the applicant committed (Commitment No. 32) to enhance the visual inspection procedures used for SCC identification to define cracking, provide additional guidance for detection of cracking, and identify specific acceptance criteria relating to "as-found" cracking. The staff reviewed this section and determines that the information in the USAR 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 Closed-Cycle Cooling Water System Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems

Summary of Technical Information in the Application. LRA Section B2.1.11 describes the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program as consistent, with enhancements, with GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems."

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program manages the loss of material and the effects of rail wear for all cranes, trolley structural components, and applicable rails within the scope of license renewal. The program periodically inspects components visually. Crane inspections verify structural integrity of the crane components required to maintain the crane intended function. Visual inspections assess such conditions as loss of material of structural members, misalignment, flaking, side wear of rails, loose tie down bolts, and excessive wear or deformation of monorails.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancements to determine whether the AMP, with the enhancements, remains 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 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M23.

Enhancements. In the LRA, the applicant credited enhancements to the GALL Report program elements "detection of aging effects" and "acceptance criteria." Specifically, the enhancements stated that:

- Procedures will be enhanced to specifically inspect for loss of material due to corrosion or rail wear.

- Procedures will be enhanced to identify industry standards or WCGS Specifications that are applicable to the component.

The staff finds these enhancements acceptable because they will make the Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program consistent with GALL AMP XI.M23, program elements 4 and 6, which state that crane rails are visually inspected and that evaluation is performed according to applicable industry standards.

The staff reviewed those portions of the Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program for which the applicant claims consistency with GALL AMP XI.M23 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program acceptable because it conforms to the recommended AMP, with the enhancements described.

Operating Experience. LRA Section B2.1.11 states that corrosion has been detected on the reactor vessel internals (RVI) lifting device. The corrosion from the lifting device flaked off and fell into the reactor vessel during the upper and lower internals were removed and reinstalled. The applicant stated that the lifting device was repainted and that its intended function was never compromised. Additionally, the applicant stated that because cranes, hoists, and fuel handling equipment have not been operated outside their design limits nor beyond their design lifetime, no fatigue-related structural failures have occurred.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed selected instances previously documented by the applicant that identified issues with the overhead heavy load and light load handling systems and where the applicant had implemented corrective action.

The staff reviewed the operating experience provided in the LRA to confirm that the plant-specific operating experience did not reveal degradation that is not bounded by industry experience. The staff reviewed documents listed in the audit summary that describe the deterioration RVI lifting device and the corrective action taken to ensure no further degradation has taken place. The staff noted that the lifting device was painted and no additional corrosion has developed, and that future inspections in accordance with the Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will correct any corrosion incidence 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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.11, the applicant provided the USAR supplement for the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. The applicant committed (Commitment No. 4) to enhance and implement the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program prior to the period of extended operation. The applicant stated that procedures will be enhanced to (1) identify industry standards or WCGS specifications that are applicable to the component, and (2) specifically inspect for loss of material due to corrosion or rail wear. The staff reviewed this section and determines that the information in the USAR 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 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirms that its implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Fire Protection

Summary of Technical Information in the Application. LRA Section B2.1.12 describes the existing Fire Protection Program as consistent with GALL AMP XI.M26, "Fire Protection," with exception and enhancements.

The Fire Protection Program manages loss of material for fire-rated doors, fire dampers, the diesel-driven fire pump, and the Halon fire suppression system; cracking, spalling, and loss of material for fire barrier walls, ceilings, and floors; and hardness and shrinkage due to weathering of fire barrier penetration seals by periodic visual inspections of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings, and floors, and periodic visual inspections and functional tests of fire-rated doors. Periodic testing of the diesel-driven fire pump ensures no loss of function due to aging of diesel fuel supply lines. The program visually inspects, at least once every 18 months, the fire barrier walls, ceilings, and floors, including coating and wraps (structural steel fireproofing, raceway fire wrap, and hatch covers), for any signs of aging like cracking, spalling, and loss of material. Approximately 10 percent of each type (electrical and mechanical as practical) of penetration seal is inspected visually and there are drop tests performed on approximately 10 percent of accessible horizontal and vertical fire dampers at least every 18 months. Fire dampers inaccessible for drop testing are inspected visually to assess integrity and availability. The fire damper inspection and drop test procedure also visually inspects fire dampers with transfer grilles, with no or limited ductwork, on both sides of safety-related fire barriers. The program visually inspects, at least annually, fire-rated doors for the integrity of door surfaces and for clearances to detect aging. The diesel-driven fire pump is under observation during performance tests for any aging of the fuel supply line. Visual inspections and function tests of the Halon fire suppression system are every 18 months.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception and enhancements to determine whether the AMP, with the exception and enhancements, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical staff and reviewed documents related to the Fire Protection Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M26.

In LRA Section B2.1.12, the applicant stated that 10 percent of each type of electrical and mechanical penetration seal is visually inspected at least once every 18 months. The staff requested that the applicant clarify whether the 10 percent population of penetration seals includes all types of seals (e.g., cables trays, conduits, pipes, ducts, and seismic gaps).

In its response, the applicant stated that the fire barrier penetration seals inspection procedure visually inspects approximately 10 percent of electrical and mechanical penetration seals and that the fire barrier inspection procedure performs a visual inspection of the exposed surface of each fire-rated assembly (i.e., fire barriers separating redundant post-fire safe-shutdown systems) for the presence of breaches and gross deterioration. The fire-rated assembly inspections include items like seismic gap seals, cable tray fire stops, and steel pipe caps.

The staff reviewed each of these procedures and confirmed that inspections are performed on *10 percent of all fire barrier penetration seals and fire barriers at least once every 18 months*. On the basis of its review, the staff finds the applicant's response acceptable because it is consistent with the recommendations in the GALL Report.

The GALL Report "detection of aging effects" program element recommends a visual inspection of the Halon system to detect any sign of degradation such as corrosion, mechanical damage, or damage to dampers. The "acceptance criteria" program element recommends that signs of corrosion and mechanical damage should not be acceptable. The applicant's license renewal program evaluation report for the Fire Protection Program states that a functional deluge test is performed on the Halon system to identify any mechanical damage and referenced WCGS surveillance procedures.

The staff's review of these procedures noted that the procedures did not address visual inspection nor provide acceptance criteria for corrosion or mechanical damage. The staff requested that the applicant clarify how it meets this GALL Report recommendation and if not, to justify why an exception to the GALL Report is not taken.

In its response, the applicant stated that the Halon system has the internal environments of plant indoor air and dry gas. The Halon system galvanized carbon steel and copper alloy materials have an internal environment of plant indoor air. The following are the Halon system materials, such that, the system has an internal environment of dry gas: bronze, carbon steel, galvanized carbon steel, cast iron, elastomer, copper alloy, and stainless steel. These material and environment combinations do not require aging management. The applicant further stated that carbon steel and cast iron materials in the Halon system are exposed to an external environment of plant indoor air and will be visually inspected with the External Surfaces Monitoring Program.

The staff evaluated the material and environment combination and reviewed the GALL Report for the same material and environment combination. The staff finds that these material and environment combinations do not have aging effects and do not require aging management. On the basis of its review, the staff finds the applicant's response acceptable. The staff concludes that visual inspections are not needed.

The GALL Report "acceptance criteria" program element recommends that no corrosion should be acceptable in the fuel oil supply line for the diesel-driven fire pump. In the LRA Section B.2.1.12, the applicant stated that performance testing in the diesel-driven fire pump is used to detect degradation and corrosion in the fuel supply lines. The staff requested that the applicant explain how the performance test will detect corrosion.

In its response, the applicant stated that the diesel-driven fire pump fuel oil supply line has an internal environment of fuel oil and is made of carbon steel. The applicant clarified that the GALL Report references item VII.G-21 for this component's configuration. This item recommends the use of fire protection and fuel oil chemistry programs. The GALL Report fuel oil chemistry program credits a one-time inspection to verify its effectiveness. The applicant stated that the LRA will be amended to take this into consideration.

In its letter dated August 31, 2007, the applicant amended the LRA Section B2.1.12 to state:

> The Fire Protection Program manages loss of material for fire rated doors, fire dampers, diesel-driven fire pump, and the halon fire suppression system, cracking, spalling, and loss of material for fire barrier walls, ceilings, and floors, and hardness and shrinkage due to weathering of fire barrier penetration seals; and hardness-loss of strength for halon fire suppression system flexible hoses. Periodic visual inspections of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors, and periodic visual inspections and functional tests of fire-rated doors are performed. The internal surface of the diesel-driven fire pump fuel oil supply line is managed by the Fuel Oil Chemistry Program ([LRA Section] B1.14), which utilizes the One-Time Inspection Program ([LRA Section] B13.16) to verify the effectiveness of the Fuel Oil Chemistry Program using a representative sample of components in systems that contain fuel oil, ensuring that there is no loss of function due to aging of the fuel oil supply line.
>
> The Fire Protection Program performs a visual inspection, at least once per year, on firerated doors to verify the integrity of door surfaces and for clearances to detect aging of the fire doors. The internal surface of the diesel-driven fire pump fuel oil supply line is managed by the Fuel Oil Chemistry program ([LRA section] B1.14), which utilizes the One-Time Inspection program ([LRA section] B1.16) to verify the effectiveness of the Fuel Oil Chemistry program using a representative sample of components in systems that contain fuel oil, ensuring that there is no loss of function due to aging of the fuel oil supply line. A visual inspection and function test of the halon fire suppression system is performed every 18 months.

On the basis that the applicant has amended the application to include the programs that are credited for performing inspection of the diesel-driven fire pump fuel oil supply line, the staff finds the applicant's response acceptable.

Exception. *In the LRA, the applicant credited an exception to the GALL Report program* elements "parameters monitored or inspected" and "detection of aging effects." Specifically, the exception stated:

> WCGS performs visual inspections and function tests of the Halon system every 18 months, not every 6 months as suggested by NUREG-1801, Section XI.M26. The 18 month inspection frequency is specified in the WCGS fire protection program, which is referenced in the USAR, and was part of the original licensing basis until the fire protection requirements were removed from the Technical Specifications and placed in plant procedures.

The 18-month Halon fire suppression functional test frequency is part of the plant's CLB and the review of WCGS operating experience indicated that this frequency is reasonable to manage the aging effects. The 18-month frequency is considered sufficient to ensure system availability and operability based on plant operating history showing that there has been no aging-related event that has adversely affected system operation. Because these aging effects occur over a considerable period of time, the staff concludes that the 18-month inspection interval will be sufficient to detect aging in the Halon fire suppression system. The staff reviewed the USAR supplement and confirmed it references these frequencies.

In addition, the staff noted that the applicant currently performs Halon fire suppression system valve position checks and operational tests every 92 days and Halon fire suppression system storage tank level and pressure checks every month. Maintenance procedures at WCGS also include visual inspections of component external surfaces for signs of corrosion and mechanical damage. The applicant's review of station operating experience identified no aging-related degradation adversely affecting the operation of the Halon fire suppression system.

On the basis of the plant's operating history and that this inspection frequency is part of the applicant's CLB, the staff finds the exception acceptable.

Enhancement 1. In the LRA Section B2.1.12, the applicant credited an enhancement to the GALL Report program elements "scope of the program," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria." Specifically, the enhancement stated:

> Fire damper inspection and drop test procedures will be enhanced to inspect damper housing for signs of corrosion.
>
> Fire barrier and fire door inspection procedures will be enhanced to specify fire barriers and doors described in USAR Appendix 9.5A, "WCGS Fire Protection Comparison to APCSB 9.5-1 Appendix A," and WCGS Fire Hazards Analysis.
>
> Training for technicians performing the fire door and fire damper visual inspections will be enhanced to include fire protection inspection requirements and training documentation.

On the basis that the enhancements, when implemented, will make the Fire Protection Program consistent with the GALL Report, the staff finds the enhancements acceptable.

During the audit, the applicant added the Halon system flexible hoses within the scope of the Fire Protection Program. The applicant stated that the Fire Protection Program will be enhanced to include visual inspection of these hoses.

By letter dated August 31, 2007, the applicant amended LRA Section B2.1.12 to add the following enhancement to the Fire Protection Program.

Enhancement 2. In the LRA Section B2.1.12 amendment, the applicant credited an enhancement to the GALL Report program elements "parameters monitored or inspected" and "detection of aging effects." Specifically, the enhancement stated:

> Prior to the period of extended operation, halon fire suppression system inspection procedures will be enhanced to include visual inspections of halon tank flexible hoses for hardening-loss of strength. Visual inspections would not be required for flexible hoses that have scheduled periodic replacement intervals.

The staff noted that Halon tank weight and pressure check surveillance tests are performed every 18 months. These tests provide opportunities for visual inspection of the Halon tank flexible hoses. The staff determines that the enhancement, when implemented, will make the Fire Protection Program consistent with the GALL Report; therefore, the staff finds the enhancement acceptable.

The staff reviewed those portions of the Fire Protection Program for which the applicant claims consistency with GALL AMP XI.M26 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Fire Protection Program acceptable because it conforms to the recommended AMP, with the exception and enhancements described.

Operating Experience. LRA Section B2.1.12 states that fire barrier penetration seals have been found with degradation during inspections that determined that it had existed since original construction. The applicant determined that the procedure version for the inspection provided no detailed location of seismic gap. The procedure was revised and seismic gap seals were inspected using the revised procedure. The LRA states that the fire barrier inspection found wear of door hinges and handles, and several penetration seals required field action to maintain a fire barrier configuration. Appropriate corrective actions have been implemented.

The applicant's Fire Protection Program self-assessment examined penetration seals for installation compliance with approved installation details and bounding test parameters. The self-assessment found and evaluated unbounded penetration seal conditions acceptance and/or functionality. The applicant stated that all penetrations found with unbounded seal conditions have been repaired or evaluated in accordance with Generic Letter 86-10 "Implementation of Fire Protection Requirements," and that no further action is required.

During the audit, the staff reviewed implementing procedures and problem identification reports, as listed in the audit summary, related to the applicant's Fire Protection Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the Fire Protection Program and where the applicant had implemented corrective action. The staff noted that the applicant's corrective actions were timely and appropriate.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.12, the applicant provided the USAR supplement for the Fire Protection Program. By letter dated August 31, 2007, the applicant amended the first paragraph of LRA Section A1.12 to state:

> The Fire Protection Program manages loss of material for fire rated doors, fire dampers, diesel-driven fire pump, and the Halon fire suppression system, cracking, spalling, and loss of material for fire barrier walls, ceilings, and floors, and hardness and shrinkage due to weathering of fire barrier penetration seals; and hardness-loss of strength of for halon fire suppression system flexible hoses Periodic visual inspections of fire barrier penetration seals, fire dampers, fire barrier walls, ceilings and floors, and periodic visual inspections and functional tests of fire-rated doors are performed. The internal surface of the diesel-driven fire pump fuel oil supply line is managed by the Fuel Oil Chemistry program ([LRA Section] A1.14), which utilizes the One-Time Inspection program (AI.16) to verify the effectiveness of the Fuel Oil Chemistry Program using a representative sample of components in systems that contain fuel oil, ensuring that there is no loss of function due to aging of diesel fuel oil supply line.

The letter also added a paragraph that states:

> Prior to the period of extended operation, Halon fire suppression system inspection procedures will be enhanced to include visual inspections of halon tank flexible hoses for hardening-loss of strength. Visual inspections would not be required for flexible hoses that have scheduled periodic replacement intervals.

In addition, the applicant committed (Commitment No. 5) to enhance its fire damper inspection and drop test procedures to specify that damper housings should be inspected for signs of corrosion and to specify the fire barriers and doors described in USAR, Appendix 9.5A, and the WCGS fire hazards analysis. The applicant also committed to enhance training for the technicians performing the fire door and fire damper visual inspections to include inspection requirements and training documentation. In its letter dated October 11, 2007, the applicant revised Commitment No. 5 to state that the Halon fire suppression system inspection procedures will be enhanced to include visual inspection of Halon tank flexible hoses (that do not have scheduled periodic replacement intervals) for hardening or loss of strength.

The staff reviewed this section and determines that the information in the USAR 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 determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 confirms that their implementation prior to the period of extended operation would make the existing

AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Fire Water System

Summary of Technical Information in the Application. LRA Section B2.1.13 describes the existing Fire Water System Program as consistent, with exceptions, with GALL AMP XI.M27, "Fire Water System."

The Fire Water System Program manages loss of material for water-based fire protection systems. Periodic hydrant inspections, fire main flushing, sprinkler inspections, and flow tests are in accordance with applicable National Fire Protection Association (NFPA) codes and standards. Nuclear Electric Insurance Limited performance-based guidance is for fire protection system inspection, testing, and maintenance intervals. The fire water system discharge pressure is monitored continuously to detect loss of system pressure immediately and initiate corrective actions. The Fire Water System Program conducts an air or water flow test through each open head spray or sprinkler head for unobstructed nozzles. The program tests a representative sample of fire protection sprinkler heads and replaces those in service 50 years with the guidance of NFPA Code 25, 2002 Edition, and tests at 10-year intervals thereafter during the period of extended operation to promptly detect signs of aging.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains 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 Fire Water System Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M27.

The applicant's license renewal program evaluation report references the Internal Surfaces in Miscellaneous Piping and Ducting Components Program to perform visual inspection of fire water system piping and components. The staff requested that the applicant describe how the Internal Surfaces in Miscellaneous Piping and Ducting Components Program evaluates wall thickness, as recommended by the GALL Report.

In its response, the applicant stated that visual inspections performed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program would detect wall thinning by identifying corrosion, surface or finish discontinuities, or a lack of symmetry of the component dimensions. If degradation is unacceptable, deficiencies would be resolved with the plant's corrective action program. The corrective action program may then specify mechanical or NDE methods to be used in quantifying the degradation consistent with QCP 20-518, "Visual Examination of Heat Exchangers and Piping Components" or other approved plant procedures.

The staff reviewed instances previously documented by the applicant that identified issues with the Fire Water System Program and where the applicant had implemented corrective action. The staff noted that the applicant's corrective actions were timely and appropriate.

On the basis that the visual inspections are performed, unacceptable degradation is identified in the corrective action program, and further action is taken to quantify the degradation by mechanical or NDE methods, the staff finds the response acceptable.

Exception. In the LRA, the applicant credited an exception to the GALL Report program element "detection of aging effects." Specifically, the exception stated:

> NUREG-1801 specifies annual hydrant hose hydrostatic tests. WCGS performs a hydrostatic test of its power block fire hoses every three years. WCGS may replace an existing fire hose with a new fire hose every five years in lieu of performing a hydrostatic test.
>
> NUREG-1801 specifies annual gasket inspections. WCGS performs gasket inspections at least once every 18 months. Since aging effects are typically manifested over several years, differences in inspection and testing frequencies are insignificant.

During the audit, the staff requested that the applicant justify and provide a basis for this 3-year frequency. The staff also requested that the applicant clarify if hydrostatic test frequency of hoses once every three years is documented in the Fire Protection Program and in commitments to 10 CFR 50.48 using the Branch Technical Position (BTP), Auxiliary and Power Conversion Systems Branch (APCSB) 9.5 1, "Guidelines for Fire Protection for Nuclear Power Plants," dated May 1, 1976, and BTP APCSB 9.5 1, Appendix A, dated August 23, 1976.

In its response, the applicant stated that USAR Table 9.5E-1, Section III.E, "WCGS Fire Protection Comparison to 10 CFR 50 Appendix R," states that interior standpipe hose is tested every three years or the fire hose is replaced every five years. The applicant clarified that hydrostatic testing of fire hoses is not discussed in BTP APCSB 9.5-1 or in its Appendix A. The basis for testing or replacement of interior fire hose is obtained from NFPA, "Inspection, Care, and Use of Fire Hose Couplings and Testing of Fire Hose," dated 1962. Specifically, NFPA Section 4.3.2 requires that hydrotesting be performed five years after the manufacture date and every three years thereafter. WCGS addresses this requirement by replacing the hose every five years because it is more economical than the manpower cost associated with performing the hydrotesting.

The staff finds that the 3-year hydrostatic test frequency is part of the plant's CLB. The staff's review of plant operating experience indicated that this frequency is reasonable to manage the aging effects. Based on plant operating history which shows that there has been no aging-related event that adversely affected system operation, the staff finds that the 3-year frequency is sufficient to ensure system availability and operability. Because these aging effects occur over a considerable period of time, the staff concludes that the 3-year inspection interval will be sufficient to detect aging in the fire hydrant hoses. The staff reviewed the information provided in the USAR and finds that it established the plant's CLB. On the basis of its review, the staff finds the exception to hydrotest the fire hydrant hose every three years or replace them every five years acceptable.

Also, the staff reviewed the exception to inspect the gaskets every 18 months in lieu of annually, and determines that, since aging effects are manifested over several years, an additional six months in inspection frequency is insignificant. On this basis, the staff finds the exception acceptable.

The staff reviewed those portions of the Fire Water System Program for which the applicant claims consistency with GALL AMP XI.M27 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Fire Water System Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.13 states that fire hydrants have been found with valves that could not be opened, with excessive leakage, and with foreign material that was flushed out after work requests initiated repair or replacement activities. In 1987, corrosion was found on carbon steel piping directly connected to ductile iron piping. Since then, an additional leak was discovered in the fire protection system outside the DG building. Subsequent excavation discovered loss of material due to pitting corrosion. The applicant determined that the fire protection system corrosion was from a break in the protective coating. Three localized areas of through-wall corrosion have been detected on the fire protection piping for the unit auxiliary transformer. The applicant evaluated this condition, determined that the system still could perform its intended function, but replaced this portion of the pipe. The fire protection sprinkler headers surrounding transformers were found corroded at the unions and threaded connections. The applicant stated that repair or replacement was initiated and the threaded surfaces of the sprinkler heads were cleaned and painted before the loss of intended function.

The LRA states that Asiatic clams were discovered in the fire protection system in 1996. The system was flushed to force them out of the system. As a corrective action a chemical injection system was installed near the jockey pump for biocide treatment of the fire protection water. Since the installation of this chemical injection system there have been no indications of clams in the fire protection system. The applicant completed its first C-factor test in 2004. The system pressure differentials met the acceptance criteria.

During the audit the staff reviewed implementing procedures and problem identification reports related to the applicant's Fire Water System Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the Fire Protection Program and where the applicant had implemented corrective action. The staff noted that the applicant's corrective actions were timely and appropriate.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.13, the applicant provided the USAR supplement for the Fire Water System Program. The staff reviewed this section and determines that the information in the USAR 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 Water System Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Fuel Oil Chemistry

Summary of Technical Information in the Application. LRA Section B2.1.14 describes the existing Fuel Oil Chemistry Program as consistent, with exceptions and enhancements, with GALL AMP XI.M30, "Fuel Oil Chemistry."

The Fuel Oil Chemistry Program manages loss of material on internal component surfaces in the emergency diesel fuel oil storage and transfer system and diesel fire pump fuel oil system. The program includes (a) surveillance and monitoring procedures for fuel oil quality maintenance by control of contaminants in accordance with applicable ASTM Standards, (b) periodic drainage of water from fuel oil tanks, (c) visual inspection of internal surfaces during periodic draining and cleaning, (d) ultrasonic measurement of emergency fuel oil storage tank wall thickness if indications of reduced cross-sectional thickness are found during the visual inspection, (e) inspection of new fuel oil before its introduction into the storage tanks, and (f) one-time inspections by the One-Time Inspection Program of a representative sample of components in systems that contain fuel oil.

Fuel oil quality is maintained by monitoring and controlling fuel oil contaminants in accordance with applicable ASTM standards by periodic sampling and chemical analysis of the fuel oil inventory and sampling, testing, and analysis of new fuel oil prior to delivery at the plant. If a sample appears to be unsatisfactory, delivery is discontinued or not allowed. All samples are taken in accordance with ASTM D4057 and shipped to a laboratory approved under the applicant's QA program for analysis. Accumulated water is removed monthly from the emergency fuel oil storage and emergency fuel oil day tanks and quarterly from the diesel fire pump fuel tank. The internal surfaces of the emergency fuel oil storage tanks are drained, cleaned, and visually inspected periodically for potential aging. The emergency fuel oil day tanks are also drained, cleaned, and visually inspected at the same time as the emergency fuel oil storage tanks. The diesel fire pump fuel tank does not have interior accessibility for cleaning.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions and enhancements to determine whether the AMP, with the exceptions and enhancements, remains 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 Fuel Oil Chemistry Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M30.

During the audit, the staff identified a difference between the Fuel Oil Chemistry Program and the GALL Report "preventive actions" program element. The Fuel Oil Chemistry Program does not provide for the periodic cleaning and inspection of the diesel fire pump fuel tank, whereas the GALL Report specifies these actions. Specifically, the Fuel Oil Chemistry Program states:

> The diesel fire pump fuel tank does not have interior accessibility for cleaning.
>
> Due to the fuel oil day tanks and diesel fire pump fuel tanks periodic sampling and testing for water and sediment, and having no history in the last ten years of having more than trace amounts of water found during sampling, no ultrasonic thickness measurements will be performed on these tanks.

The staff noted that since water and particulate contamination and corrosion has been detected in WCGS fuel oil tanks, there is the potential that microbiologically influenced corrosion (MIC), pitting, and general corrosion might be present in the diesel fire pump fuel tank. Degradation could be progressing through the tank wall undetected since cleaning and visual inspection have not been performed for the diesel fire pump fuel tank. The staff noted that an alternative method will not be employed to detect wall thinning, and that biocides and/or corrosion inhibitors have not been used to mitigate corrosion. The applicant indicated that operating experience for the other fuel oil tanks justifies not having to implement preventive actions.

The staff requested that the applicant provides additional information to justify not having to implement preventive actions, such as cleaning and visually inspecting the diesel fire pump fuel tank on a periodic basis, if alternate inspection methods such as UT are not employed. The staff also requested that the applicant explain why this is not an exception to the GALL Report.

In its response, the applicant stated that the diesel fuel oil tanks internal material and environment are similar to the emergency fuel oil day tanks. Periodic sampling and testing for water and sediment, performed during the past 10 years, has demonstrated that neither tank showed water and sediment levels exceeding the normal chemistry of 0.05 percent. This demonstrates that both tanks have the same material and internal environment.

The applicant stated that periodic sampling, cleaning, and visual inspection of the emergency fuel oil day tanks will act as a representative sample and will ensure that significant aging is not occurring in other fuel oil day tanks. The emergency fuel oil tanks inspection results will be of value in assessing the condition of the diesel fire pump fuel oil tanks since these tanks have similar internal materials and environments. Any adverse condition found in the inspected emergency fuel oil day tanks will be assumed to be occurring in the fuel oil day tanks and diesel fire pump fuel tanks, and preventive actions will be taken in accordance with the plant's corrective action program. In its response, the applicant committed (Commitment No. 6) to perform a one-time UT or pulsed eddy current thickness examination on the external surface of the diesel fire pump fuel oil tank.

<u>Exception 1</u>. In the LRA, the applicant credited an exception to the GALL Report program element "preventive actions." Specifically, the exception stated that:

> WCGS does not add fuel oil stabilizers, corrosion inhibitors, or biocides; it relies on the periodic sampling and analysis for particulates and corrosion products. Any accumulated water is removed monthly from the emergency fuel oil storage

and emergency fuel oil day tanks and quarterly from the diesel fire pump fuel tank.

The applicant stated that degradation of the diesel fuel oil tanks cannot occur without exposure of the tank internal surfaces to contaminants in the fuel oil, such as water and microbiological organisms. Compliance with diesel fuel oil standards and periodic multi-level sampling provide assurance that fuel oil contaminants are below the acceptable levels. Internal surfaces of tanks (except the diesel fire pump fuel tank) are drained, cleaned, and visually inspected to detect potential degradation. Water and biological activity or particulate contamination concentrations are monitored and trended at least quarterly.

The applicant stated that based on industry operating experience, quarterly sampling and analysis of fuel oil provide for timely detection of conditions conducive to corrosion before the loss of the tank's intended function. If indications of degradation are found in the future, additions of corrosion inhibitors and biocides will be considered as part of the corrective action process, similar to the case when corrosion was found in the emergency fuel oil storage tanks.

On the basis of its review, the staff finds that this exception to the GALL Report is acceptable because sampling for particulate and water contamination and periodic tank dewatering will provide an environment that is not conducive to corrosion.

Exception 2. In the LRA, the applicant credited an exception to the GALL Report program elements "parameters monitored or inspected" and "acceptance criteria." Specifically, the exception stated that:

> WCGS uses only ASTM Standard D1796-83, not D1796 and D2709. Wolf Creek's Tech Spec is committed to using only D1796-83. The testing conducted using ASTM D1796 gives quantitative results, whereas D2709 testing gives only pass-fail results; therefore, the D1796 method gives more descriptive information about the fuel oil condition than the D2709 method.

The staff reviewed ASTM D 2709 and D 1796 to determine if both standards are necessary to assure fuel oil quality. The staff noted that both standard test methods use a centrifuge method to determine water and sediment contents using a 100 ml sample. The staff determines that using only ASTM D 1796 is adequate to quantitatively determine water and sediment contents in fuel oil. Additionally, the staff noted that the applicant adheres to the plant's technical specifications, as recommended in the GALL Report. On this basis, the staff finds that this exception to the GALL Report is acceptable.

Exception 3. In the LRA, the applicant credited an exception to the GALL Report program element "acceptance criteria." Specifically, the exception stated that:

> WCGS uses the guidance of D 2276, Method A, for determination of particulates, as opposed to the combination of D 2276 and D 6217. ASTM D6217 states that it is the first ASTM standard test method for assessing the mass quantity of particulates in middle distillate fuels. Test Method D5452 and its predecessor, Test Method D2276, were developed for aviation fuels and used 1 gallon or 5 Liters of fuel sample. Using greater than or equal to 1 gallon of middle distillate fuel often requires significant time to complete the filtration. The

> D6217 test method uses about a quarter of the volume in the D2276 aviation fuel method. There is no indication that ASTM D6217 is either technically superior to D2276, as far as managing the effects of aging (it merely allows for faster filtration), or that the combination of the two standards adds any value beyond using just D2276 itself.

The staff reviewed ASTM D 2276 and D 6217. The staff noted that using ASTM D 2276, Method A, alone is adequate to quantitatively determine particulate content in fuel oil. Additionally, the staff noted that the applicant adheres to the plant's technical specifications as recommended in the GALL Report.

During the audit, the staff reviewed ASTM D 2276-00 and could not find the acceptance criteria in this standard test method. The staff requested that the applicant clarify what is the source for its acceptance criteria.

In its response, the applicant indicated that there are acceptance criteria in the plant's chemistry specification manual. After review of this manual, the staff finds the acceptance criteria and the basis for the criteria are in accordance with the plant's technical specifications requirements as recommended by the GALL Report. On this basis, the staff finds that this exception to the GALL Report is acceptable.

By letter dated August 31, 2007, the applicant amended LRA Section B2.1.14 to include the following exception.

<u>Exception 4</u>. In the LRA amendment, the applicant credited an exception to the GALL Report program element "detection of aging effects." Specifically, the exception stated that :

> The diesel fire pump fuel oil tank does not have interior accessibility for cleaning. Periodic sampling and testing for water and sediment has demonstrated that neither the emergency fuel oil day tanks or the diesel fire pump fuel oil tank have any history, within the last ten years, of water or sediment exceeding the normal chemistry level. Periodic sampling, cleaning, and visual inspection of the emergency fuel oil day tanks will act as a representative sample and ensure that significant aging is not occurring in the diesel fire pump fuel oil tanks. A one-time ultrasonic (UT) or pulsed eddy current (PEC) thickness examination on the external surface of the diesel fire pump fuel oil tank will be performed to detect corrosion related wall-thinning.

The staff determines that there is an equivalency between the emergency fuel oil day tanks and the diesel fire pump oil tanks based on materials of construction, periodic sampling for water and particulate contamination, sediment levels, and operating experience. This equivalency ensures wall thinning in the diesel fire pump fuel tank will be managed during the period of extended operation because any degradation found in the emergency fuel oil day tanks will trigger preventive actions through the plant's corrective action program.

The staff also noted that a one-time inspection of the diesel fire pump fuel tank bottom performed before entering the period of extended operation, will confirm that there is no age-related degradation. On this basis, the staff finds this exception to the GALL Report acceptable.

Enhancement 1. In the LRA, the applicant credited an enhancement to the GALL Report program elements "preventive actions" and "detection of aging effects." Specifically, the enhancement stated:

> Procedures will be enhanced to provide for supplemental ultrasonic thickness measurements if there are indications of reduced cross-sectional thickness found during the visual inspection of the emergency fuel oil storage tanks. The emergency fuel oil day tanks will be added to the 10-year drain, clean, and internal inspection program.

The applicant stated that the emergency fuel oil day tanks will be added to the 10-year drain, clean, and internal inspection program. Cleaning and visual inspection of the emergency fuel oil day tanks will (1) provide assurance that these tank are not subject to loss of material and indicators of corrosion for the diesel fire pump fuel tank, and (2) implement the recommendations of the GALL Report providing additional assurance that the effects of aging for the emergency fuel oil day tanks will be adequately managed.

The staff noted that corrosion may occur at locations where contaminants accumulate, such as a tank bottom, and ultrasonic thickness measurements in areas where corrosion is visually detected ensure that significant wall thinning is not occurring. The applicant stated that it will perform supplemental ultrasonic thickness measurements in areas where corrosion is discovered to characterize the extent of wall thinning. The wall thinning trend will be used by the applicant in the engineering disposition of any detected corrosion.

On this basis, the staff finds this enhancement acceptable since, when implemented, the Fuel Oil Chemistry Program will be consistent with the GALL Report and will provide additional assurance that the effects of aging for the emergency fuel oil day tanks will be adequately managed.

By letter dated August 31, 2007, the amended LRA Section B2.1.14 to add the following enhancement.

Enhancement 2. In the LRA amendment, the applicant credited an enhancement to the GALL Report program elements "detection of aging effects." Specifically, the enhancement stated:

> A one-time ultrasonic (UT) or pulsed eddy current (PEC) thickness examination on the external surface of the diesel fire pump fuel oil tank will be performed to detect corrosion related wall-thinning. The examination will be performed once between 10 and 2 years prior to the period of extended operation.

The staff finds this enhancement acceptable since, when the enhancement is implemented, the Fuel Oil Chemistry Program will be consistent with the GALL Report and will provide additional assurance that the effects of aging for the diesel fire pump fuel oil tank will be adequately managed.

The staff reviewed those portions of the Fuel Oil Chemistry Program for which the applicant claims consistency with GALL AMP XI.M30 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Fuel Oil Chemistry Program acceptable because it conforms to the recommended AMP, with the exceptions and enhancements described.

Operating Experience. LRA Section B2.1.14 states that plant-specific operating experience indicates that both emergency fuel oil storage tanks have experienced high particulate counts. The fuel oil tanks are checked regularly for the presence of water and sediment and the emergency fuel oil storage tanks for particulates; any instances are corrected promptly. Neither the fuel oil day tanks nor the diesel fire pump fuel tanks have any history of water and sediment levels exceeding the normal chemistry level.

The LRA states that the internals of the emergency fuel oil storage tanks were visually inspected in 2002. This inspection revealed deterioration of the interior coating of one of the emergency fuel oil storage tanks and rust on the interior walls. An engineering evaluation determined that the failure of the interior coating should not cause failure of the diesel system to perform its intended functions and that the rust found during this inspection was acceptable as it was and not at a stage that cause component failure. The applicant stated that future inspections will document any deteriorated conditions in corrective actions. After the discovery of the condition of the emergency fuel oil storage tank interior coating, biocide was added to that tank and all of the diesel fuel oil in the emergency fuel oil storage tanks was replaced with new fuel oil. Since that discovery, one of the emergency fuel oil day tanks has been visually inspected with no coating degradation found. The other fuel oil day tank was scheduled to be visually inspected by the end of 2006.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal degradation that is not bounded by industry experience. The staff reviewed documents listed in the audit summary that describe the deterioration of the interior coating with associated corrosion of the steel tank wall and the corrective action taken to ensure no further degradation has taken place. Since the Fuel Oil Chemistry Program operating experience shows that corrosion has been discovered in the emergency fuel oil storage tank, the staff requested that the applicant provides the frequency at which UT is performed when degradation is discovered in the diesel fuel tanks.

In its response, the applicant stated that UT inspections are only required if indications of reduced cross sectional thickness is found. The frequency at which UT is performed on the emergency fuel oil tanks has not been determined because a degradation requiring UT has not been found. A visual inspection in 2002 revealed that the interior coating of one of the emergency fuel oil storage tanks was deteriorated and some rust had developed in the interior walls of the tank. The applicant stated that an engineering evaluation determined that the failure of the interior coating of the emergency fuel oil storage tank should not result in degradation or failure of the diesel system to perform its intended functions. The applicant also determined that the rust identified during this inspection was an acceptable condition because it is not at a stage that could result in a failure to perform its intended function. The applicant stated that any degraded conditions in future inspections will be documented in a non-conformance work order. The applicant stated that upon the discovery of the condition of the emergency fuel oil storage tank interior coating, a biocide was added to that tank and all of the diesel fuel in the emergency fuel oil storage tanks was subsequently replaced with new fuel. Since the discovery of the condition of the emergency fuel oil storage tank interior coating, one of the emergency fuel oil day tanks has been visually inspected, and no coating degradation was found. In 2006, both day tanks were inspected and no debris or degradation of the coatings was found.

The staff reviewed the applicant's response and finds this response acceptable because additional corrosion in fuel oil tanks has not been discovered, corrective action has been taken through biocide additions and oil replacement, and future visual inspections of the emergency fuel storage tanks will identify any progression of corrosion that will initiate UT inspection of the degraded area.

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. Therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.14, the applicant provided the USAR supplement for the Fuel Oil Chemistry Program. The applicant committed (Commitment No. 6) to enhance and implement the Fuel Oil Chemistry Program and to provide supplemental ultrasonic thickness measurements if there are indications of reduced cross-sectional thickness found during the visual inspection of the emergency fuel oil storage tanks. By letter dated May 25, 2007, the applicant revised this commitment to (1) include the emergency fuel oil day tanks to the 10-year drain and internal inspection program, and (2) include a one-time UT or pulsed eddy current thickness examination on the external surface of the engine-driven fire pump fuel oil tank to detect corrosion related wall thinning. By letter dated August 31, 2007, the applicant amended LRA Section A1.14 to incorporate the changes made to Commitment No. 6. The staff reviewed this section and determines that the information in the USAR 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 Fuel Oil Chemistry Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and its justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirms that its implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Selective Leaching of Materials

Summary of Technical Information in the Application. LRA Section B2.1.17 describes the new Selective Leaching of Materials Program as consistent, with an exception, with GALL AMP XI.M33, "Selective Leaching of Materials."

The Selective Leaching of Materials Program manages loss of material due to selective leaching for brass (greater than 15 percent zinc) and gray cast iron components within the scope of license renewal exposed to raw water or closed-cycle cooling water. Components susceptible to selective leaching are in the fire protection system, the auxiliary building HVAC system, the containment purge HVAC system, the control building HVAC system, the fuel building HVAC system, the miscellaneous buildings HVAC system, the standby diesel engine system, and the oily waste system. There are no bronze alloy components susceptible to selective leaching. The program includes a one-time inspection of a selected sample of component internal surfaces. Visual and mechanical methods determine whether loss of material due to selective leaching occurs. If these inspections detect dezincification or graphitization, indications of selective leaching, a followup evaluation will be performed. This evaluation may require confirmation of selective leaching with a metallurgical evaluation (which may include a microstructure examination). The sample size for the system, material, and environment combination may be expanded based upon the results of the evaluation and confirmatory testing. Initial visual evaluations required by this program will be completed prior to the period of extended operation. If indications of selective leaching are confirmed, there will be followup evaluations.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception (and associated technical basis), remains adequate to manage the aging effects.

The staff interviewed the applicant's technical staff and reviewed documents related to the Selective Leaching of Materials Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M33.

Exception. In the LRA, the applicant credited an exception to the GALL Report program elements "preventive actions," "parameters monitored or inspected," and "detection of aging effects." Specifically, the exception stated:

> A qualitative determination of selective leaching will be used in lieu of Brinell hardness testing for components within the scope of the Selective Leaching of Materials aging management program. The exception involves the use of examinations, other than Brinell hardness testing identified in NUREG-1801, to identify the presence of selective leaching of material. The exception is justified, because: (1) hardness testing may not be feasible for most components due to form and configuration (i.e., heat exchanger tubes), and (2) other mechanical means (i.e., scraping, or chipping, provide an equally valid means of identification).

During the audit, the applicant stated that selective leaching in gray cast iron occurs when the iron is dissolved, leaving a weakened structure with no geometrical changes in the component. Similarly, selective leaching in copper alloys occurs when zinc is dissolved. Since visual inspection alone will not detect selective leaching, some mechanical means is necessary to detect the weakened structure of the material. The GALL Report recommends hardness testing to detect a weakened structure, although other mechanical means may be as effective as the hardness testing. The applicant stated that scraping or chipping the material provides an equally valid means of detecting selective leaching. However, the LRA did not provide detailed mechanical test methods. The staff requested that the applicant provides additional justification that supports that these alternative mechanical methods are reliable for detecting selective leaching.

In its response, the applicant stated that chipping and scraping of the mechanical methods will detect a corroded component structure. If these methods detect dezincification or graphitization, then a follow up examination or evaluation will be performed. The examination or evaluation may require confirmation of selective leaching with a metallurgical evaluation, which may include a microstructure examination.

The staff agrees that chipping and scraping will remove material of a weakened microstructure due to selective leaching, thus providing an indication of selective leaching during visual examination.

On the basis that mechanical probing of gray cast iron and high zinc copper alloy components along with metallurgical examination of weakened materials will be effective in detecting selective leaching, the staff finds that this exception to GALL Report is acceptable.

The staff reviewed those portions of the Selective Leaching of Materials Program for which the applicant claims consistency with GALL AMP XI.M33 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Selective Leaching of Materials Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.17 states that the new Selective Leaching of Materials Program does not have plant-specific operational history. During ECTs of the EDG heat exchanger tubing in 2001, several tubes were found with defect indications originating on the tubing inside diameter. To support the root cause investigation of these indications, selected tubes were removed from the EDG heat exchangers and destructively examined. The laboratory examinations revealed no evidence of selective leaching (e.g., dezincification) in any of the tube sections.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Selective Leaching of Materials Program. The staff also interviewed the applicant's personnel who have knowledge of the program. The staff reviewed selected instances previously documented by the applicant that identified issues with selective leaching of materials and where the applicant had implemented corrective action.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical staff to confirm that the plant-specific operating experience did not reveal degradations that are not bounded by industry experience. The staff reviewed documents listed in the audit summary that describe operating experience with de-alloying of heat exchanger tubing. The applicant credits a one-time inspection in the Selective Leaching of Materials Program. The Selective Leaching of Materials Program provides for an expanded inspection scope and inspection schedule if de-alloying is found. As a result of this operating experience, the staff requested that the applicant provides the plan and schedule for these additional inspections for selective leaching.

In its response, the applicant stated that the indications in the copper-nickel tubes described in the problem identification reports were suspected to be the result of de-alloying, but that assumption was never verified. Subsequent eddy current testing revealed multiple degradation indications. Metallurgical evaluation of the tubing showed no de-alloying. Most indications were identified as erosion-corrosion.

The staff finds that the actions in response to the problem identification reports demonstrate the effectiveness of the Selective Leaching of Materials Program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.17, the applicant provided the USAR supplement for the Selective Leaching of Materials Program. The applicant committed (Commitment No. 8) to implement the Selective Leaching of Materials Program prior to the period of extended operation. During the audit, the staff requested that the applicant clarify the meaning of the term "visual, mechanical methods." By letter dated August 31, 2007, the applicant amended LRA Section A1.17 to state "visual and mechanical methods." The staff reviewed this section and determines that the information in the USAR 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 Selective Leaching of Materials Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 One-Time Inspection of ASME Code Class 1 Small-Bore Piping

Summary of Technical Information in the Application. LRA Section B2.1.19 describes the existing One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program as consistent, with exception, with GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping."

The One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program manages cracking of stainless steel ASME Code Class 1 piping of 4 inches or less. This program is a part of the Risk-Informed Inservice Inspection Program. For ASME Code Class 1 small-bore piping, the Risk-Informed Inservice Inspection Program requires volumetric examinations (by UT) to detect cracking on weld locations selected based on the guidelines of EPRI TR-112657. Ultrasonic examinations are in accordance with ASME Code Section XI with acceptance criteria from paragraphs IWB-3131 and IWB-2430. The fourth interval of the ASME Code Section XI Inservice Inspection Program will report results for the one-time inspection of ASME Code Class 1 small-bore piping. In compliance with 10 CFR 50.55a(g)(4)(ii), the ASME Code Section XI Inservice Inspection Program is updated each successive 120-month inspection interval to comply with the latest edition of the ASME Code specified 12 months before the start of the inspection interval.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remains 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 of ASME Code Class 1 Small-Bore Piping Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M35.

During the audit, the staff requested that the applicant clarify if there are any socket welds identified as high safety significant locations as part of the Risk-Informed Inservice Inspection Program. The EPRI topical report on RI-ISI specifies that high safety significant locations be volumetrically examined. The staff requested that the applicant explain what volumetric examination method will be used to examine the socket welds if they are classified as high safety significant.

In its response, the applicant stated that there are no socket welds identified as high safety significant locations as part of the Risk-Informed Inservice Inspection Program.

The applicant stated that for ASME Code, Class 1, small-bore piping, the Risk-Informed Inservice Inspection Program requires volumetric examinations (i.e., UT) on selected weld locations to detect cracking. Weld locations are selected based on the guidelines provided in EPRI TR-112657. UT examinations are conducted in accordance with the ASME Code, Section XI, with acceptance criteria from Paragraphs IWB-3131 and IWB-2430. The fourth interval of the ISI program at WCGS will provide the results for the one-time inspection of ASME Code, Class 1, small-bore piping.

<u>Exception</u>. In the LRA, the applicant credited an exception to the GALL Report program element "acceptance criteria." Specifically, the exception stated:

> The WCGS ISI Program uses ASME Section XI, 1998 Edition through 2000 Addenda, as modified by 10 CFR 50.55a, and approved code cases. NUREG-1801, Section XI.M35, specifies the use of ASME Section XI, 2001 edition with 2002 and 2003 addenda. There are no differences in the two code versions for Paragraphs IWB-3131 and IWB-2430.

Because current approval to use ASME Code, Section XI, code cases does not provide justification or a basis for their use during the period of extended operation, the staff requested that the applicant clarify why the LRA identifies approved code cases in this exception.

By letter dated August 31, 2007, the applicant amended the exception in LRA Section B2.1.19 to state:

> The WCGS ISI Program uses ASME Section XI 1998 Edition through 2000 addenda. NUREG-1801, Section XI.M35 specifies the use of ASME Section XI, 2001 edition with 2002 and 2003 addenda. There are no differences in the two code versions for Paragraphs IWB-3131 and IWB-2430.
>
> WCGS will use the ASME Code Edition consistent with the provisions of 10 CFR 50.55a during the 10-year period prior to the period of extended operation (4th interval) and during the period of extended operation.

The staff finds that this exception is acceptable because there are no differences in the two code versions for Paragraphs IWB-3131 and IWB-2430.

The staff reviewed those portions of the One-Time Inspection of ASME Code Class 1 Small Bore Piping Program for which the applicant claims consistency with GALL AMP XI.M35 and finds that they are consistent with the GALL AMP. The staff finds the applicant's One-Time Inspection of ASME Code Class 1 Small Bore Piping Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.19 states that there has been no cracking of stainless steel ASME Code Class 1 piping with nominal pipe size (NPS) of less than or equal to 4 inches, or in piping with NPS of greater than or equal to 1 inch.

During the audit, the staff reviewed implementing procedures and problem identification reports that are related to the applicant's One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff did not identify any instances where the applicant's operating experience is outside the envelope of industry experience or where omissions in the applicant's current program resulted in failure to maintain intended functions of components that are within the scope of the program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.19, the applicant provided the USAR supplement for the One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program. The applicant committed (Commitment No. 10) that the fourth interval of the ISI program at WCGS will provide the results for the one-time inspection of ASME Code, Class 1, small-bore piping. The staff reviewed this section and determines that the information in the USAR 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 of ASME Code Class 1 Small-Bore Piping Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 Lubricating Oil Analysis

Summary of Technical Information in the Application. LRA Section B2.1.23 describes the existing Lubricating Oil Analysis Program as consistent, with an exception, with GALL AMP XI.M39, "Lubricating Oil Analysis."

The Lubricating Oil Analysis Program manages loss of material and reduction of heat transfer for components within the scope of license renewal. The program maintains lubricating oil contaminants within acceptable limits to preserve an environment not conducive to aging effects and includes acceptance criteria based on original equipment manufacturer or industry guidelines for oil chemical and physical properties, wear metals, contaminants, additives, and water. Increased impurities and degradation of oil properties indicate aging of materials exposed to lubricating oil. Additionally, ferrography on oil samples trends wear particle concentrations for the RCPs upper and lower bearing oil and other components. Monitoring and trending of lubricating oil analysis results detects component aging prior to loss of intended function. Corrective actions, when alert action levels or limits are reached, include increased sampling frequency, additional oil filtration, oil change-out, visual inspections, and corrective maintenance.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remains 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 Lubricating Oil Analysis Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.M39.

Exception. In the LRA, the applicant credited an exception to the GALL Report program element "parameters monitored or inspected." Specifically, the exception stated that:

> WCGS does not specify flash point testing as part of the Lubricating Oil Analysis Program as indicated in NUREG-1801, Section XI.M39. The WCGS lubricating oil analysis program instead specifies a fire point analysis to determine fuel contamination. The fire point analysis is a test method for determining the lowest temperature a test specimen can sustain combustion for 5 seconds following the introduction of an ignition source. Flash point and fire point are determined using the same standard ASTM test method (ASTM D92) and are equally effective measures for determining the suitability of lubricating oils for continued use with regards to fuel contamination.

The staff reviewed ASTM D92 to compare the details of flash point and fire point analyses. The flash point is the lowest temperature at which application of a test flame causes the vapors to ignite; whereas, the fire point is the temperature when burning is sustained for a minimum of 5 seconds. Both parameters are indicators of flammability of lubricating oil and can be used as indicators of dilution of lubricating oil with, for example, fuel oil. The applicant indicated that lubricating oil that is not routinely changed is monitored for any change in fire point. Any trend of fire point will be analyzed by the Predictive Maintenance Group. If adverse trends are identified, corrective action will be initiated, including increased sampling frequencies, oil change, and/or visual inspection.

The staff noted that the license renewal program evaluation report states that the plant's Predictive Maintenance Group reviews lubricating oil analysis results and determines the acceptability for continued service using engineering judgment. The staff requested that the applicant provides documentation that shows the analyses trending performed by the Predictive Maintenance Group.

In its response, the applicant provided examples of lubricating oil analysis results. Oil analysis results are reviewed by the Predictive Maintenance Group to determine if there are unusual trends, or if alert levels have been reached or exceeded.

The staff reviewed the oil analysis result examples provided by the applicant and finds that these reports provide the data to identify any adverse trends in lubrication oil quality.

On the basis that flammability of lubricating oil can be determined using the fire point of the oil instead of the flash point, the staff finds that this exception to the GALL Report is acceptable.

The staff reviewed those portions of the Lubricating Oil Analysis Program for which the applicant claims consistency with GALL AMP XI.M39 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Lubricating Oil Analysis Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.23 states that there have been no instances of component failure attributed to lubricating oil contamination or degradation. Analysis results indicate no water pooling in lubricating oil.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Lubricating Oil Analysis Program. The staff also interviewed the applicant's onsite personnel. The staff reviewed selected instances previously documented by the applicant that identified issues with lubricating oil quality and where the applicant had implemented corrective action.

The staff reviewed problem identification reports and work orders listed in the audit summary and found no indication of wear or water pooling. The lack of wear, water pooling, and equipment failures resulting from poor lubricating oil quality provide an indication of the effectiveness of the Lubricating Oil Analysis Program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.23, the applicant provided the USAR supplement for the Lubricating Oil Analysis Program. The staff reviewed this section and determines that the information in the USAR 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 Lubricating Oil Analysis Program, the staff determines that those program elements for which the applicant claimed 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 ASME Code Section XI, Subsection IWE

Summary of Technical Information in the Application. LRA Section B2.1.27 describes the existing ASME Code Section XI, Subsection IWE Program as consistent, with exceptions, with GALL AMP XI.S1, "ASME Section XI, Subsection IWE."

The ASME Code Section XI, Subsection IWE Program manages aging of the steel liner of the concrete containment building, including the containment liner plate, piping and electrical penetrations, access hatches, moisture barrier, and the fuel transfer tube. Inspections are in accordance with ASME Code Section XI, Subsection IWE, 1998 Edition with no addenda to manage any containment liner aging effects that could cause loss of intended function. Acceptance criteria for components subject to ASME Code Section XI, Subsection IWE exam requirements are specified in Article IWE-3000. In compliance with 10 CFR 50.55a(g)(4)(ii), the ASME Code Section XI Inservice Inspection Program is updated during each successive 120-month inspection interval to comply with the latest code edition and addenda specified 12 months before the start of the inspection interval.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains 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 ASME Code Section XI, Subsection IWE Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.S1.

Exception 1. In the LRA, the applicant credited an exception to the GALL Report program element "scope of the program." Specifically, the exception states:

> Pressure retaining containment seals and gaskets are not addressed by the 1998 edition of ASME Code Section XI, Subsection IWE. These components are evaluated per 10 CFR Part 50, Appendix J.

During the audit, the staff reviewed the applicant's ASME Code Section XI, Subsection IWE Program and finds that the IWE containment ISI program at WCGS is in accordance with ASME Code, Section XI, 1998 Edition with no Addenda. The staff finds that the pressure retaining containment seals and gaskets are not addressed by the ASME Code, Section XI, 1998 Edition, Subsection IWE. However, the applicant's 10 CFR Part 50, Appendix J Program provides for local leak rate testing of elastomer material, and containment seals and gaskets.

The staff noted that the GALL Report "parameters monitored or inspected" program element states that the examination method for all pressure retaining components, which includes containment seals and gaskets, is the 10 CFR Part 50, Appendix J, leak rate testing. On this basis, the staff finds the exception acceptable because 10 CFR Part 50, Appendix J testing is referenced in the GALL Report as an acceptable AMP for managing the aging effects of containment seals and gaskets.

Exception 2. In the LRA, the applicant credited an exception to the GALL Report program element "parameters monitored or inspected." Specifically, the exception states:

> Table IWE-2500-1 does not specify seven categories for examination in the 1998 or later editions of ASME Code Section XI, Subsection IWE. The ASME Code Section XI, Subsection IWE Program is in accordance with the 1998 Edition of ASME Code Section XI (with no addenda), Subsection IWE, supplemented with the applicable requirements of 10 CFR 50.55a(b)(2)(ix). The WCGS IWE CISI program, which adheres to these code requirements, is consistent with the 2001 edition of ASME Code Section XI, Subsection IWE, including the 2002 and 2003 Addenda, for the parameters monitored by this program.

During the audit, the staff reviewed the applicant's ASME Code, Section XI, Subsection IWE Program. WCGS uses the ASME Code, Section XI, 1998 Edition with no Addenda for the interval from 1998 to 2008. The IWE containment ISI program, which adheres to these code requirements, is consistent with the ASME Code, Section XI, 2001 Edition, Subsection IWE, including the 2002 and 2003 Addenda.

The staff noted that the applicant's use of the ASME Code, Section XI, 1998 Edition with no Addenda for the third 10-year inspection interval has been approved pursuant to 10 CFR 50.55a, and that the third 10-year inspection interval does not continue into the period of extended operation.

The staff finds that, during the period of extended operation, the applicant will use ASME Code, Section XI, editions and addenda that will be endorsed by the staff in accordance to the requirements of 10 CFR 50.55a, as a basis for its ASME Code Section XI, Subsection IWE Program. Also, the staff finds that these endorsed editions and addenda provide requirements for the containment ISI that are equivalent to those referenced in the GALL Report. On this basis, the staff finds that the applicant's use of ASME Code, Section XI, editions and addenda different from those referenced in the GALL Report is acceptable. The staff finds that the applicant's exception to the GALL Report is acceptable.

Exception 3. In the LRA, the applicant credited an exception to the GALL Report program element "monitoring and trending." Specifically, the exception states:

> WCGS manages containment liner aging in accordance with procedures which require when flaws or areas of degradation are accepted by engineering evaluation, the area containing the flaw or degradation shall be reexamined in accordance with IWE-2420(b) and (c). This ASME Code requirement specifies that flaws or areas of degradation no longer require augmented examination if they remain essentially unchanged for the next inspection period. This is not consistent with NUREG 1801, Section XI.S1, Element 5, which requires that they remain essentially unchanged for three consecutive inspection periods.

The staff reviewed the ASME Code, Section XI, Subsection IWE Program and finds that the ASME Code, Table 1, IWE 2430 was deleted from the ASME Code, Section XI, 1998 Edition. The staff also finds that it is also absent from the ASME Code, Section XI, 2001 Edition, with 2002 and 2003 Addenda. The changes to Table IWE 2500-1 eliminate several examination categories. The categories that remain require 100 percent examination; therefore, no items are available for additional examinations.

On the basis that the changes made to ASME Code, Section XI, Table IWE 2500-1, now require 100 percent examination of all remaining categories, and that the reexamination is performed in accordance with ASME Code, Section XI, IWE-2420 (b) and (c), the staff finds this exception acceptable. The staff finds that performing additional examinations is not necessary.

The staff reviewed those portions of the ASME Code Section XI, Subsection IWE Program for which the applicant claims consistency with GALL AMP XI.S1 and finds that they are consistent with the GALL AMP. The staff finds the applicant's ASME Code Section XI, Subsection IWE Program acceptable because it conforms to the recommended AMP, with the exceptions described.

Operating Experience. LRA Section B2.1.27 states that an inspection of the containment liner plate during the 1996 refueling outage included both internal containment liner and external containment concrete surfaces which indicated no corrosion, pitting, or other degraded liner plate conditions. This result is documented in the applicant's response to NRC IN 97-10, "Liner Plate Corrosion in Concrete Containments." With the exception of pitting on the in-core instrument tunnel sump, all degradation in the containment liner discovered during normal inspections have been minor. The applicant stated that in 2002, as part of the ASME Code Section XI Inservice Inspection Program, a general visual examination of the in-core instrument tunnel sump noted areas of apparent liner plate degradation indicated by rust and degraded coatings. The coatings were removed, a detailed visual examination was performed, and an engineering evaluation was required to approve continued operation of this section of the liner plate in this condition. In addition, inspections performed in 2003 noted two additional recordable indications. After a detailed visual inspection, one area was prepped and recoated and the disposition of the second was used as-is.
During the audit, the staff asked the applicant to clarify if there have been any containment liner plate inspections performed since 1996.

In its response, the applicant provided the owner's activity report documenting the containment liner plate inspections. The report provides the following information regarding the containment ISI program findings:

- First Interval, First Period 2002 findings:

  (1) There were no components containing flaws or relevant conditions that required an evaluation to determine acceptability for continued service.

  (2) There were no Class MC components that required repairs, replacements, or corrective measures for continued service.

- First Interval, Second Period 2006 findings:

  (1) A general visual exam found localized pitting in the liner floor of the incore tunnel sump.

(2) A detailed visual exam was performed to determine the magnitude and extent of degradation to the incore tunnel sump liner. Pitting was the only degradation found. It was believed that the pitting resulted from nearby welding that damaged the coating. An evaluation performed by design engineering determined that the remaining wall thickness is sufficient and that recoating the pitted area with a qualified coating will stop further degradation. The pitted areas have been recoated with a qualified coating. The incore tunnel sump liner was found to be acceptable for continued service, and the areas containing the pitting were identified for reexamination during the next inspection period.

(3) The WCGS Corrective Action Program addressed programmatic concerns. Applicable procedures were reviewed and revised as necessary to ensure compliance with IWE requirements and to establish acceptance criteria for pitting of the containment liner plate.

- First Interval, Third Period 2007 findings:

(1) There were no containment liner plate components containing flaws or relevant conditions that required an evaluation to determine acceptability for continued service.

(2) There were no repairs, replacements, or corrective measures performed on any Class MC or CC items during the period of this report that were required due to an item containing a flaw or relevant condition that exceeded acceptance criteria.

The staff also requested that the applicant provides a description of the degradation found in the in-core instrument tunnel sump in 2002 and 2003.

In its response, the applicant stated a detailed visual exam was performed to determine the magnitude and extent of degradation to the in-core tunnel sump liner. Pitting was the only degradation found. It is believed that the pitting resulted from nearby welding that damaged the coating. An evaluation performed by design engineering determined that the remaining wall thickness is sufficient and that recoating the pitted area with a qualified coating will stop further degradation. The pitted areas have been recoated with a qualified coating. The in-core tunnel sump liner was found to be acceptable for continued service, and the areas containing the pitting were identified for reexamination during the next inspection period.

The staff finds that the applicant response is acceptable because it did not reveal degradations that are not bounded by industry experience. In addition, the staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

<u>USAR Supplement</u>. In LRA Section A1.27, the applicant provided the USAR supplement for the ASME Code Section XI, Subsection IWE Program. The staff reviewed this section and

determines that the information in the USAR 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 ASME Code Section XI, Subsection IWE Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and their justifications and determines that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 ASME Code Section XI, Subsection IWL

Summary of Technical Information in the Application. LRA Section B2.1.28 describes the existing ASME Code Section XI, Subsection IWL Program as consistent, with enhancement, with GALL AMP XI.S2, "ASME Section XI, Subsection IWL."

The ASME Code Section XI, Subsection IWL containment ISI program manages aging of the concrete containment structure (including the tendon gallery ceiling), the concrete dome, and the post-tensioning system. For the 1998 through 2008 inspection interval, the applicant inspects concrete in accordance with the 1998 Edition of ASME Code Section XI (with no addenda), Subsection IWL, supplemented with applicable 10 CFR 50.55a(b)(2)(xiii) requirements. Additional commitments define the visual examinations parts of the program and the qualification requirements for inspectors. Acceptance criteria for components subject to ASME Code Section XI, IWL examination requirements are specified in Article IWL-3000. In compliance with 10 CFR 50.55a(g)(4)(ii), the ISI Program is updated during each successive 120-month inspection interval to comply with the latest code edition and addenda specified 12 months before the start of the inspection interval.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 ASME Code Section XI, Subsection IWL Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.S2.

Enhancement. In the LRA, the applicant credited an enhancement to the GALL Report program element "detection of aging effects." Specifically, the enhancement states:

> The 2003 edition of ASME Code Section XI, Subsection IWL, Article IWL-2000, includes two provisions regarding inspection of repair/replacement activities that are not required by the 1998 edition. IWL-2410(d) specifies additional inspections for concrete surface areas affected by a repair/replacement activity, and IWL-2521.2 specifies additional inspections for tendons affected by a

repair/replacement activity. In accordance with 10 CFR 50.55a, WCGS will revise their ASME Code Section XI, Subsection IWL Containment Inservice Inspection Program prior to the next inspection interval to incorporate the ASME code edition and addenda incorporated into 10 CFR 50.55a at that time.

During the audit, the staff noted that the plant's IWL components are inspected in accordance with IWL-2000, as discussed in WCRE-11, "Containment Inservice Inspection Program Plan." The structural integrity (tendon) and the concrete exams were performed on December 18, 1984, and May 23, 2000, respectively. The plant is beyond ten years of commercial operation; therefore, the frequency of concrete exams is now five years, plus or minus one year.

The staff noted that as described in C-158(Q), "Technical Specification for Containment Tendon Surveillance," tendons for surveillance are selected in a random manner and are representative of the various types of tendons and conditions of exposure existing in the containment. There are 86 inverted u-shaped tendons and 165 hoop tendons (i.e., 135 in the cylinder and 30 in the dome). The ASME Code, Section XI, 1998 Edition, Table IWL-2521-1, specifies that inspections in the tenth year, and every fifth year thereafter, include two percent of each type of tendon. ASME Code, Paragraph IWL-2521(c), specifies that the population from which the random sample is drawn shall consist of all tendons of a particular type not examined during earlier inspections. At WCGS, surveillance conducted every five years consist of three inverted u-shaped and three hoop tendons. One inverted u-shaped tendon (i.e., V65) and one hoop tendon (i.e., 45BA) are kept unchanged for each surveillance. The prestressing force in all inspection sample tendons is determined by the liftoff method. One tendon from each group of tendons is completely de-tensioned to allow for the removal of one tendon wire, which is inspected and subjected to laboratory testing.

The ASME Code, Section XI, 2001 Edition, Subsection IWL-2000, includes two provisions that are not required by the 1998 Edition. ASME Code, IWL-2410(d), specifies additional inspections for concrete surface areas affected by a repair or replacement activity, and IWL-2521.2 specifies additional inspections for tendons affected by a repair or replacement activity. In accordance with 10 CFR 50.55a, WCGS will revise their containment ISI program prior to the next inspection interval to incorporate the ASME Code, edition and addenda, endorsed by 10 CFR 50.55a.

The staff requested that the applicant clarify why the enhancement references the ASME Code, Section XI, 2003 Edition, which does not exist.

In its letter dated August 31, 2007, the applicant amended LRA Section B2.1.28 and Commitment No. 15 to state ASME Code, Section XI, 2001 Edition with 2002 and 2003 Addenda.

The staff reviewed the applicant's ASME Code Section XI, Subsection IWL procedures, and their aging effects requiring management under the "detection of aging effects" program element of the ASME Code Section XI, Subsection IWL Program. The staff finds this information acceptable since the corrective action program will consider expanding the scope, if significant degradation is observed.

The staff finds this enhancement acceptable because, when implemented, the applicant's ASME Code Section XI, Subsection IWL will be consistent with the GALL Report and will provide additional assurance that the effects of aging will be adequately managed.

The staff reviewed those portions of the ASME Code Section XI, Subsection IWL Program for which the applicant claims consistency with GALL AMP XI.S2 and finds that they are consistent with the GALL AMP. The staff finds the applicant's ASME Code Section XI, Subsection IWL Program acceptable because it conforms to the recommended AMP, with the enhancement described.

Operating Experience. LRA Section B2.1.28 states that the results of the twentieth year (2005) surveillance report of the post-tensioning system, including inspection of the unbonded post-tensioning system (Examination Category L-B), and the visual examination of the containment concrete surfaces (Examination Category L-A), showed no abnormal degradation. The results of the 2000 physical inservice tendon inspection of the containment building post-tensioning system, including both the concrete surfaces (Examination Category L-A) and the unbonded post-tensioning system (Examination Category L-B), concluded that the containment structure has experienced no abnormal degradation of the post-tensioning system. The applicant stated that plant-specific operating experience shows no unacceptable degradation of the concrete containment building or the post-tensioning system.

During the audit, the staff requested that the applicant explain the result of the 20-year tendon surveillance, which found some excessive grease void volumes.

In its response, the applicant stated that in the twentieth year surveillance of the post-tensioning system, four tendons were found to accept greater than 10 percent of the tendon duct volume of grease when refilled after testing, with the highest being 17.4 percent. These conditions were evaluated by design engineering and found not to be significant conditions. The apparent cause of these excess voids was determined to be an elevated initial filling temperature along with a short soak time, resulting in increased shrinkage. Examination of the tendons found no deterioration. The engineers also consulted a study conducted at Callaway Nuclear Station, addressing a similar condition with their unbonded tendons. The essential criterion for the operability of the sheathing filler material is to prevent corrosion of both the tendon wires and the anchorage components. The material used at Callaway and at WCGS accomplishes this by a characteristic which gives the filler material: (1) an affinity to adhere to steel surfaces, (2) its ability to emulsify any moisture in the system; therefore, nullifying its rusting ability, and (3) its resistance to moisture, mild acids, and alkalis. In addition, each tendon wire is individually pre-coated prior to installation for added protection.

The staff reviewed the applicant's response and finds it acceptable because the material used at WCGS emulsifies any moisture in the system nullifying its rusting ability and is resistant to moisture, mild acids, and alkalis (i.e. the material nullifies rusting and is resistant to harsh conditions).

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical staff to confirm that the operating experience did not reveal degradations that are not bounded by industry experience. In addition, the staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.28, the applicant provided the USAR supplement for the ASME Code Section XI, Subsection IWL Program. The applicant committed (Commitment No. 15) to enhance procedures to include two new provisions regarding inspection of repair and replacement activities. In addition, by letter dated May 25, 2007, the applicant revised Commitment No. 15 to correct the ASME Code reference to read, "ASME Code, Section XI, 2001 Edition with 2002 and 2003 addenda." The staff reviewed this section and determines that the information in the USAR 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 ASME Code Section XI, Subsection IWL Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancement and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 ASME Code Section XI, Subsection IWF

Summary of Technical Information in the Application. LRA Section B2.1.29 describes the existing ASME Code Section XI, Subsection IWF Program as consistent, with exception, with GALL AMP XI.S3, "ASME Section XI, Subsection IWF."

The ASME Code Section XI, Subsection IWF Program manages aging for Classes 1, 2, and 3 component supports. There are no Class MC supports at WCGS. For the September 3, 2005 through September 3, 2015 inspection interval, Classes 1, 2, and 3 component support ISIs are in accordance with the ASME Code Section XI, Subsection IWF 1998 Edition through 2000 Addenda. Inspection scope for supports is based on class and total population as defined in Table IWF-2500-1. Detection of deficiencies during regularly scheduled inspections requires reexamination of the support during the next inspection period. Component supports immediately adjacent to supports requiring corrective action are also examined. The primary inspection method is visual examination. In compliance with 10 CFR 50.55a(g)(4)(ii), the ASME Code Section XI Inservice Inspection Program is updated during each successive 120-month inspection interval to comply with the requirements of the latest code edition and addenda specified 12 months before the start of the inspection interval.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the exception to determine whether the AMP, with the exception, remains 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 ASME Code Section XI, Subsection IWF Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.S3.

Exception. In the LRA, the applicant credited an exception to the GALL Report program elements "scope of the program" and "parameters monitored or inspected." Specifically, the exception states:

> WCGS uses the 1998 Edition through the 2000 addenda of the ASME Section XI code instead of the 2001 Edition with 2002 and 2003 addenda which is referenced in NUREG-1801, Section XI.S3.

The staff noted that the affected program elements are those where the GALL Report includes a reference to specific ASME Code, Section XI, Subsection IWF, requirements. The staff finds that this is an exception to the GALL Report's recommendations because the applicant's ASME Code Section XI, Subsection IWF Program is based on ASME Code, Section XI, editions and addenda that are different from the ASME Code Section XI edition and addenda referenced in the GALL Report.

The staff noted that the applicant is in its third 10-year inspection interval and that the use of ASME Code Section XI, 1998 Edition through the 2000 Addenda for the third 10-year inspection interval is consistent with provisions in 10 CFR 50.55a. The staff also noted that the third 10-year inspection interval ends on September 2, 2015, and does not continue into the period of extended operation.

The staff finds that, during the period of extended operation, the applicant will use ASME Code Section XI editions and addenda that will be endorsed by the staff, in accordance with 10 CFR 50.55a, as a basis for its ASME Code Section XI, Subsection IWF Program. The staff also finds that the endorsed ASME Code Section XI editions and addenda provide examination requirements adequate to identify potential degradation in supports for ASME piping and components. On this basis, the staff finds that the use of ASME Code Section XI editions and addenda are different from those referenced in the GALL Report. This exception to the GALL Report is acceptable.

The staff reviewed those portions of the ASME Code Section XI, Subsection IWF Program for which the applicant claims consistency with GALL AMP XI.S3 and finds that they are consistent with the GALL AMP. The staff finds the applicant's ASME Code Section XI, Subsection IWF Program acceptable because it conforms to the recommended AMP, with the exception described.

Operating Experience. LRA Section B2.1.29 states that a review of the owner activity reports for interval 2 indicated that there were 282 required examinations for ASME Code Classes 1, 2, and 3 component supports. All required examinations were completed. The applicant replaced one ASME Class 1 support sway strut for the chemical and volume control system (CVCS) letdown piping. The sway strut had a bent paddle that appeared to have been damaged during refueling operations, not by normal service or aging. The applicant stated that the ASME Code Section XI, Subsection IWF Program is updated to incorporate industry operating experience. ASME Code Section XI is also revised every three years and addenda issued in the interim to allow code updates to reflect operating experience. The applicant stated that the requirement to update the ASME Code Section XI, Subsection IWF Program to refer to more recent editions of the ASME Code Section XI at the end of each inspection interval makes the program reflect enhancements of incorporated operating experience.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical personnel to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's ASME Code Section XI, Subsection IWF Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff found no omissions in the applicant's current program that resulted in failure to maintain the intended functions of components that are within the scope of the program.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.29, the applicant provided the USAR supplement for the ASME Code Section XI, Subsection IWF Program. The staff reviewed this section and determines that the information in the USAR 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 ASME Code Section XI, Subsection IWF Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.20 Masonry Wall Program

Summary of Technical Information in the Application. LRA Section B2.1.31 describes the existing Masonry Wall Program as consistent, with enhancement, with GALL AMP XI.S5, "Masonry Wall Program."

The Masonry Wall Program is part of the Structures Monitoring Program that implements structures monitoring requirements pursuant to 10 CFR 50.65. The program manages aging of masonry walls and their structural steel restraint systems within the scope of license renewal guided by NRC IE Bulletin 80-11, "Masonry Wall Design," and NRC IN 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to NRC IE Bulletin 80-11." The Masonry Wall Program states inspection guidelines, lists causes of aging of masonry walls to be monitored during structural monitoring inspections, and establishes examination criteria, evaluation requirements, and acceptance criteria.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 Masonry Wall Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.S5.

Enhancement. In the LRA, the applicant credited an enhancement to the GALL Report program element "scope of the program." Specifically, the enhancement states:

> Procedures will be enhanced to identify unreinforced masonry in the radwaste building within the scope of license renewal that requires aging management.

The staff reviewed the plant procedures and the aging effects requiring management under the scope of the Masonry Wall Program. The staff finds this information acceptable since the corrective action program will consider expanding the scope if significant degradation is observed.

The staff finds this enhancement acceptable because, when the enhancement is implemented, the Masonry Wall Program will be consistent with the GALL Report and provides additional assurance that the effects of aging will be adequately managed.

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 AMP. The staff finds the applicant's Masonry Wall Program acceptable because it conforms to the recommended AMP, with the enhancement described.

Operating Experience. LRA Section B2.1.31 states that the baseline evaluation of the Maintenance Rule observations was completed in 1998. Aging effects were observed on masonry walls in the auxiliary building, communication corridor, control building, and turbine building. Cracking was the most frequently observed aging effect on masonry walls. Other types of deterioration that could lead to increased aging effects on masonry walls were missing bolt support angles, pop-outs due to installation of steel components, and the presence of water.

The LRA states that based upon the baseline evaluation of Maintenance Rule observations completed in 1998, subsequent inspections of structures with masonry walls within the scope of license renewal with aging effects took place between 2002 and 2003. The control building had cracks repaired with grout, but the joint was moving enough to re-crack the repair. The wall is located in an area not subject to weather or threatened by water exposure. The applicant stated that the wall will continue to be monitored until a history demonstrates its stability. The masonry will retain an "acceptable with degradation" status. The turbine building was observed to have several masonry walls categorized as "acceptable with degradation." The applicant stated that in most cases during the five-year re-inspection, conditions stabilized from the baseline observation attained a downgraded category. The latest inspection revealed that the length and size of one crack continue to increase. Engineering (applicant) evaluated this wall and determined that it will still perform intended functions. The applicant stated that it will continue to monitor this condition.

During the audit, the staff requested that the applicant: (1) provide details on the operating experience relating to the degradation found in 2002 and 2003, (2) explain how this compares to the 1998 established baseline, including the acceptance criteria for cracking, deterioration, missing anchor bolts, anchor bolts pop-outs, and the presence of water, (3) clarify if a scope expansion was required because of unacceptable conditions identified, and (4) identify any additional inspections scheduled for the next inspection period.

In its response, the applicant stated:

(1) Inspections that took place between 2002 and 2003 are summarized as follows:

- A masonry wall in the control building had cracks visible on both sides. The cracks were repaired with grout, but the joint was moving enough to re-crack the repair. The wall is located in an area not subject to weather or a threat to water exposure. Design engineering (applicant) evaluated this condition and determined that there had been no change in the described conditions since the previous inspection, and the described condition is not indicative of any structural concern. This item was re-categorized as "Acceptable With Minor Degradation," and will be re-inspected during the next scheduled inspection.

- Several masonry walls in the turbine building were observed to have minor cracks categorized as "Acceptable With Degradation." In most cases during the 5-year re-inspection, the conditions had stabilized from the baseline observation resulting in a downgraded category. In the north wall of the southeast turbine building truck bay, a previous attempt had been made to repair the crack and was not accessible from the opposite side due to a building column. No leakage is involved that could lead to corrosion. The latest inspection reveals that the length and size of crack continues to increase. Design engineering has evaluated this wall and determined that it will still perform its intended functions.

During the Advisory Committee of Reactor Safeguards (ACRS) sub-committee meeting on March 5, 2008, the ACRS made an inquiry about the intended function and the acceptability of the masonry wall in the turbine building (truck bay) that has a crack in the inaccessible area. In its responses to the ACRS's inquiry, the applicant clarified via a conference call on March 12, 2008, that the wall in question is located on the north wall of the southeast turbine building truck bay, and is not within the scope of license renewal. The wall is a fire barrier for commercial (property) protection, not for fire protection of safety-related equipment. In the letter dated March 29, 2008, the applicant removed reference to this wall from the LRA. The staff confirmed that the wall in question is not within the scope of license renewal by reviewing the applicant's drawing and verifying that the wall listing is for insurance purpose only (there are no (a)(1) components associated with safety function in the turbine building). The turbine building (a)(2) intended function is to prevent adverse interaction with the external safety-related SSC's (when subjected to design basis wind loads) and the internal masonry wall in question is not credited in performance of this function. Therefore, the staff found the applicant's response acceptable.

(2) Based on the 1998 baseline inspections, several masonry walls in the Control Building and Turbine Building had aging effects classified as "Acceptable With Degradation."

- A support angle attached to a masonry wall was found to be missing an anchor bolt. The angle supports the building's metal siding and is not a seismic support for the wall. This situation was evaluated by design engineering, who determined that no further action was required due to the redundancy of the design. Several pop outs around anchor bolts or through-bolts were identified. All of these were determined to have occurred during construction, not as a result of aging. Design engineering evaluated all of the cases and determined that the damage did not prevent any of the components from performing their intended functions. None were found to have increased degradation during subsequent inspections.

- No operating experience pertaining to the presence of water in masonry walls was found.

(3) No scope expansion was required. All items that remain classified as "Acceptable with Degradation" will be inspected again during the next inspection period. No cases of "major degradation" were found.

(4) There were no additional inspections scheduled for the next inspection period. All items that remain classified as "Acceptable with Degradation" will be inspected again during the next inspection period.

The staff finds that the applicant response is acceptable because it did not reveal degradations that are not bounded by industry experience. In addition, the staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.31, the applicant provided the USAR supplement for the Masonry Wall Program. The applicant committed (Commitment No. 16) to enhance procedures to identify the unreinforced masonry in the radwaste building requiring aging management within the scope of license renewal. The staff reviewed this section and determines that the information in the USAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Masonry Wall Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancement and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.21 Structures Monitoring Program

Summary of Technical Information in the Application. LRA Section B2.1.32 describes the existing Structures Monitoring Program as consistent, with enhancement, with GALL AMP XI.S6, "Structures Monitoring Program."

The Structures Monitoring Program manages cracking, loss of material, and change in material properties by monitoring the condition of structures and structural supports within the scope of license renewal. The program provides inspection guidelines and walkdown checklists for concrete elements, structural steel, masonry walls, treated wood, structural features (e.g., caulking, sealants, roofs, etc.), structural supports, and miscellaneous components like doors. The program includes all masonry walls within the scope of license renewal and inspects supports for equipment, piping, conduit, cable tray, HVAC, and instrument components. Although coatings may be applied to the external surfaces of structural members, no credit was taken for these coatings in the determination of aging effects for the underlying materials. The Structures Monitoring Program evaluates the condition of the coatings as an indication of the condition of the underlying materials.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 Structures Monitoring Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.S6.

Enhancement 1. In the LRA, the applicant credited an enhancement to the GALL Report program element "parameters monitored or inspected." Specifically, the enhancement states:

> Procedures will be enhanced to add inspection parameters for treated wood.

The staff reviewed the aging effects requiring management under the parameters monitored or inspected of the Structures Monitoring Program. The staff finds that the offsite power supply poles for the SBO are treated wood. Visual inspections are performed at 5-year intervals. Visual inspections of buried plant structures are performed when opportunistic excavation occurs. However, more frequent inspections may be performed based on past inspection results, industry experience, or exposure to a significant event (e.g., tornado, earthquake, fire, or chemical spill). The staff finds this enhancement acceptable because, when the enhancement is implemented, the Structures Monitoring Program will be consistent with the GALL Report and provides additional assurance that the effects of aging will be adequately managed.

During the audit, the staff also requested that the applicant address the aging management of inaccessible concrete areas and clarify the aggressiveness or non-aggressiveness of groundwater.

In its response, the applicant provided its most recent groundwater monitoring results. By letter dated August 31, 2007, the applicant amended LRA Section B2.1.32 to add the following enhancement.

Enhancement 2. In the LRA amendment, the applicant credited an enhancement to the GALL Report program element "parameters monitored or inspected." Specifically, the enhancement states:

> The Structures Monitoring Program will be enhanced to monitor groundwater for pH, sulfates, and chlorides. Two samples of groundwater will be tested every five years.

The staff finds this enhancement acceptable because monitoring of groundwater would verify that aging effects due to an aggressive environment will not occur.

During the audit, the staff requested that the applicant explain why the LRA does not make reference to documents or codes to be used as guidance for conducting a concrete condition survey and to evaluate the existing safety-related concrete structures.

In its response, the applicant stated that the inspection methods, inspection frequency, and inspector qualifications are in accordance with plant procedures, which reference American Concrete Institute (ACI) 349.3R-96, American Society of Civil Engineers 11-90, and ACI 201.1R-92.

The staff finds the response acceptable because the appropriate references are provided. Further, by letter dated August 31, 2007, the applicant adequately amended LRA Section B2.1.32 to incorporate these references.

As a result of the onsite inspection performed by the staff during the weeks of September 10, and October 22, 2007, the applicant added an enhancement to this program. By letter dated November 16, 2007, the applicant amended LRA Section B2.1.32 to add the following:

Enhancement 3. In the LRA amendment, the applicant credited an enhancement to the GALL Report program element "scope of the program." Specifically, the enhancement states:

> Procedures will be enhanced to add disconnect enclosure and foundation in the switchyard.

The staff finds, as described in SER Section 2.4.10, that the applicant added disconnects 13-21 and 13-23 within the scope of license renewal. The staff finds this enhancement acceptable because it ensures that the subject component will be adequately monitored with this AMP.

On this basis, the staff finds these enhancements acceptable because, when enhancements are implemented, the Structures Monitoring Program will be consistent with the GALL Report and provides additional assurance that the effects of aging will be adequately managed.

Operating Experience. LRA Section B2.1.32 states that the baseline walkdown inspection for the Structures Monitoring Program occurred in 1998. The results of this inspection were categorized primarily as "acceptable with minor degradation." All items found to have more severe aging effects were categorized as "acceptable with degradation," reexamined, and evaluated for further action. No items required a categorization of "major degradation." The applicant stated that during the five-year reinspection in 2002-2003, four items had increased degradation. Two previously categorized as "acceptable with degradation" are not within the scope of license renewal and two previously categorized as "acceptable with minor degradation" had increased degradation and were reclassified as "acceptable with degradation." One item was corrosion on an essential service water hanger in the communications corridor, the other corrosion on a steel column in the turbine building. Corrective action has been initiated. Five new items categorized as "acceptable with degradation" were reported during the 2002-2003 inspection. The applicant stated that none of these items required immediate action to maintain their intended functions and all will be monitored for future changes.

During the audit, the staff requested that the applicant clarify if a scope expansion was required because of unacceptable conditions identified during the 2002-2003 inspection. In its response, the applicant stated that all concrete structures and the components that are within the scope of license renewal and covered by the Structures Monitoring Program are inspected and compared to the acceptance criteria in accordance with ACI 201.1R and ACI 349.3R. Specific limits for each type of degradation are provided in applicable plant procedures. During the 5-year inspection in 2002-2003, only four items were identified as having increased aging effects. Two of those items previously categorized as "acceptable with degradation" are not within the scope of license renewal. Two items that were previously categorized as "acceptable with minor degradation" were noted to have increased aging effects and reclassified as "acceptable with degradation." One was corrosion on an essential service water hanger in the communications corridor, and the other was corrosion on a steel column in the turbine building.

The applicant stated that five new items categorized as "acceptable with degradation" were reported during the 2002-2003 inspection. Four of the items have been corrected including: (1) platforms and ladders in the auxiliary building require painting, (2) grating in the auxiliary building has missing clips, (3) grating in the DG building has a loose clip, and (4) structural steel in the turbine building has corrosion. The fifth item, cracked flashing on a roof hatch in the auxiliary building, will be monitored for future changes in aging effects. No scope expansion was required. All items that remain classified as "acceptable with degradation" will be inspected during the next inspection period. No cases of "major degradation" were found.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical staff to confirm that the operating experience did not reveal degradations that are not bounded by industry experience. In addition, the staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.32, the applicant provided the USAR supplement for the Structures Monitoring Program. The applicant committed (Commitment No. 17) to enhance procedures to add inspection parameters for treated wood. By letter dated May 25, 2007, the applicant revised Commitment No. 17 to include monitoring of groundwater for pH, sulfates, and chlorides. Two samples of groundwater will be tested every five years. By letter dated November 16, 2007, the applicant amended LRA Section A1.32 to enhance the procedures to add inspection parameters for the disconnect enclosures and foundations in the switchyard. The staff reviewed this section and determines that the information in the USAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Structures Monitoring Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.22 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

Summary of Technical Information in the Application. LRA Section B2.1.33 describes the existing RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program as consistent, with enhancements, with GALL AMP XI.S7, "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants."

Regulatory Guide 1.127 Inspection of Water Control Structures Associated with Nuclear Power Plants Program manages aging due to extreme environmental conditions and the effects of natural phenomena that may affect water-control structures. The applicant is committed to RG 1.127, Revision 1. The program implements the requirements of 10 CFR 50.65, the Maintenance Rule program that incorporates the guidance of RG 1.160, Revision 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and Nuclear Management and Resources Council (NUMARC) 93-01, Revision 2. This program includes:

- Periodic visual inspections of in-scope concrete structures using techniques from such industry standards and codes as ACI 201.1R.
- Periodic monitoring of the hydraulic and structural condition of the ultimate heat sink (UHS) as prescribed in USAR Section 2.5.6.8.4, as well as its structures, main dam service spillway, and auxiliary spillway.
- Periodic dredging of the UHS reservoir (every fifteen years) and channel (every five years) connecting the reservoir to the ESW pumphouse.

- Survey of the UHS dam for vertical movement every five years and a complete profile when warranted by unusual events.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancements to determine whether the AMP, with the enhancements, remains 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.S7.

During the audit, the staff requested that the applicant explain the baseline, past, and present survey reading (i.e., vertical movements) of the UHS dam. The staff also requested that the applicant clarify the acceptance criteria and provide any operating experience related to this dam.

In its response, the applicant stated that the UHS dam is a normally submerged seismic Category I earthen structure whose side slopes and crest are protected with riprap. The crest of the dam was surveyed before being covered with riprap. The baseline survey of the settlement monuments was completed after construction and before filling of the cooling lake and the submergence of the UHS dam within the cooling lake. The settlement monuments are anchored within the dam embankment and project above the riprap. Current dam elevations are determined by subtracting the as-built top of monument elevation and as-built top of dam elevation from the current monument elevation. The UHS dam elevation is required to be at or above elevation 1,070 feet mean sea level. The minimum as-built elevation for the crest of the dam was 1,070.30 feet mean sea level. The most recent elevation was found to be 1,070.24 feet. An elevation survey of the settlement monuments on the UHS dam demonstrated that the top surface of the dam is at or above the required 1,070-foot elevation. The variances between the new elevations and the adjusted previous years elevations revealed no abnormal changes, trends or unsafe movements of the dam structure.

Since all of the as-found elevations were above the baseline of 1,070 feet, the staff finds the applicant response acceptable.

Enhancement 1. In the LRA, the applicant credited an enhancement to the GALL Report program element "scope of the program." Specifically, the enhancement states:

> Procedures will be enhanced so that the main dam service spillway and the auxiliary spillway will be inspected in accordance with the same specification that governs the other water control structures that are in-scope for license renewal.

During the audit, the staff reviewed the aging effects requiring management under the scope of this AMP. The staff finds that WCGS is committed to RG 1.127, Revision 1, and has a program in place that is consistent with the elements of this RG, as recommended in the GALL Report. The program implements the requirements of 10 CFR 50.65 which incorporates the guidance of RG 1.160, Revision 2, and NUMARC 93-01, Revision 2.

The staff also finds that the plant's inspection frequency is at least once every five years based on the acceptable inspection results from previous inspections. This is consistent with RG 1.127, position C4. Concrete surface descriptions conform to ACI 201.1R, "Guide for Making a Condition Survey of Concrete in Service," and are consistent with the descriptions in ACI 349.3R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures."

The staff finds this enhancement acceptable because, when enhancements are implemented, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be consistent with the GALL Report and will provide assurance that the effects of aging are adequately managed.

Enhancement 2. In the LRA, the applicant credited an enhancement to the GALL Report program element "parameters monitored or inspected." Specifically, the enhancement states:

> Procedures will be enhanced to clarify the scope of inspections for the main dam service and auxiliary spillways, and to add cavitation to the list of concrete aging effects for surfaces other than spillway.

During an audit, the staff noted that the concrete structures above water are inspected by the plant's department of engineering. Structures below water are inspected by divers, whom provide the results, evidence, and records for evaluation. Photographic records are obtained of any unusual conditions. These inspections include a visual examination of concrete surfaces for evidence of cracking, spalling, cavitation, and erosion movements, seepage, or separation. Drains are examined for signs of blockage and clogging to ensure that they are performing satisfactorily. Foundations are monitored for evidence of damage, distress, or possible undermining. The auxiliary spillway and the main dam service spillway are examined for any conditions that impose operational constraints on the functioning of the spillways. This includes any conditions that may contribute to blockage, stability of slopes and cantilever walls, and condition of outlet channels.

The staff finds the applicant's inspection program is acceptable since the corrective action program will consider expanding the scope if significant degradation is observed.

On this basis, the staff finds this enhancement acceptable because, when implemented, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, will be consistent with the GALL Report and will provide additional assurance that the effects of aging will be adequately managed.

Enhancement 3. In the LRA, the applicant credited an enhancement to the GALL Report program element "detection of aging effects." Specifically, the enhancement states:.

> Procedures will be enhanced to add the 5-year frequency for inspecting the main dam service spillway.

During an audit, the staff noted that the main dam service spillway is monitored once every five years. Special examinations are performed if any unusual conditions arise. WCGS procedures establish requirements for surveillance and require that special surveillances be performed immediately after the occurrence of unusual events, including but not restricted to, 5-foot lake level fluctuations, earthquakes, tornadoes, or intense local rainfalls that occur during operation period.

The staff finds that the applicant inspection program is acceptable since the corrective action program will consider expanding the scope if significant degradation is observed.

The staff finds this enhancement acceptable because, when implemented, the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be consistent with the GALL Report, and will provide additional assurance that the effects of aging are adequately managed.

The staff reviewed those portions of the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program for which the applicant claims consistency with GALL AMP XI.S7 and finds that they are consistent with the GALL AMP. The staff finds the applicant's RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program acceptable because it conforms to the recommended AMP, with the enhancements described.

Operating Experience. LRA Section B2.1.33 states that the latest inspection report for the UHS and its safety-related structures in 2002 concluded that there were no signs of unacceptable conditions or deterioration of the safety-related water control structures. An elevation survey of the settlement monuments on the UHS dam revealed no abnormal changes, trends, or unsafe movements of the dam structure. The estimated sedimentation volume is within the acceptable volume. The sediment in the channel is minimal due to the recent dredging. The inspection of the main dam service and auxiliary spillways in 2004 found the concrete surfaces at the service spillway and discharge chute in generally good condition. The applicant stated that previous repairs are performing satisfactorily. No trees or deep-rooted vegetation was observed adjacent to the chute. The concrete surfaces at the auxiliary spillway are also generally in good condition. The approach area leading to the spillway and discharge channel was clear of obstructions.

During the audit, the staff requested that the applicant explain why and when the repairs were made to the main dam, service, and auxiliary spillways.

In its response, the applicant stated that the upstream main dam surface was repaired in 2001 near the water line with additional riprap due to the degradation and exposure of the sand and gravel riprap base. The 2004 surveillance report noted that riprap slope protection was in good condition and the repair work completed in 2001 adequately corrected deficiencies noted in the 1999 inspection. The main dam is not within the scope of license renewal because is not relied upon to perform a safe shutdown and is under the jurisdiction of the Kansas Department of Agriculture, Division of Water Resources.

The applicant stated that the 1999 surveillance report discusses the condition of the service spillway. Some popouts and spalling have occurred and are being repaired as needed. The ogee crest was grouted prior to 1999 and some minor seepage is returning. Emerging trees were removed along the spillway channel in 1994 and 1999. The 2004 report states that previous patching and grouting was holding up well. However, in 2006, it was found that the previous repairs at joints in the floor of the service spillway chute have numerous shrinkage cracks. Some of the repairs have broken loose exposing the original concrete. A work order was generated to address this condition. Some random cracking and spalling along the concrete auxiliary spillway have been noted several times. The cracks were evaluated in 1999 and no serious deficiencies were determined. The approach and discharge channels have had vegetation removed in the past and were reported clear of obstructions in the 2004 surveillance report.

The staff reviewed the operating experience provided in the LRA and interviewed the applicant's technical staff to confirm that the operating experience did not reveal degradations that are not bounded by industry experience. In addition, the staff finds that the corrective action program, which captures internal and external plant operating experience issues, will ensure that operating experience is reviewed and incorporated in the future to provide objective evidence to support the conclusion that the effects of aging are adequately managed.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.33, the applicant provided the USAR supplement for the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The applicant committed (Commitment No. 18) to enhance procedures to: (1) inspect the main dam service spillway and the auxiliary spillway, (2) clarify the scope of inspections for the spillways, and add cavitation to the list of concrete aging effects for surfaces other than spillways, and (3) add the 5-year inspection frequency for the main dam service spillway. The staff reviewed this section and determines that the information in the USAR 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 "RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program," the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.23 Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

Summary of Technical Information in the Application. LRA Section B2.1.36 describes the existing Electrical Cable Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, as consistent, with enhancement, with GALL AMP XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The Electrical Cable Connections Not Subject to 10 CFR 50.49 EQ Requirements Program manages the aging effects of loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation so that electrical cable connections within the scope of license renewal not subject to 10 CFR 50.49 EQ requirements can perform intended functions. Infrared thermography testing on a representative sample of non-EQ electrical cable connections for active or passive components within the scope of license renewal is part of the predictive maintenance program. The infrared thermography testing detects loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. The selected sample is based upon application (medium and low voltage), circuit loading (energized, nonenergized during normal plant operations), and environment (plant indoor air). The sample of non-EQ electrical cable connectors is representative, with reasonable assurance, of non-EQ electrical cable connections within similar applications, circuit loading conditions, and environments. The infrared thermography testing is on a six-month monitoring interval meeting the requirement of at least once every ten years. The sample of non-EQ electrical cable connections within the scope of license renewal is tested for loosening of bolted connections. The acceptance criteria for thermography testing are based on temperature rise above the reference temperature. The reference temperature is the ambient temperature or the baseline temperature data from the same type of connection as that tested. Corrective actions for conditions adverse to quality are in accordance with the corrective action program as part of the QA program. The corrective action process provides reasonable assurance that deficiencies adverse to quality are either evaluated as acceptable or corrected promptly.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 Electrical Cable Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP XI.E6.

The GALL Report recommends tests, such as thermography, contact resistance testing or other appropriate testing justified in the application. In addition, EPRI TR-104231, "Bolted Joint Maintenance & Application Guide," recommends measuring contact resistance using a low ohm meter to detect loose connections. In the Electrical Cable Connection Not Subject to 10 CFR 50.49 EQ Requirements Program, the applicant states that infrared thermography is used to identify loose connections.

During the audit, the staff requested that the applicant explain how thermography is an effective method for detecting loose connections or high resistance for cable connections in low current or low load circuits where temperature rise may not be detectable.

In its response, the applicant stated that LRA Sections B2.1.36 and A1.36 will be amended to include contact resistance testing, or other appropriate methods for low voltage, low current, or low load circuit.

The staff finds the applicant's response acceptable because contact resistance testing is effective for low voltage, low current, or low load circuit. Thermography may not be effective to detect high resistance for cable connections in low voltage, low load, and low current circuits.

By letter dated August 31, 2007, the applicant amended LRA Section B2.1.26 to state:

> The acceptance criteria for thermography testing are based on the temperature rise above the reference temperature. The reference temperature will be ambient temperatures or the baseline temperature data from the same type of connections being tested. A one-time inspection of a sample of low voltage low current or low load connections will be performed prior to the period of extended operation. The inspection will consist of contact resistance testing or other appropriate testing methods used to identify loosening of low voltage low current or low load connections. The selected sample will be based upon application (low voltage), circuit loading (low current or low load), and environment (plant indoor air and outdoor air). The one-time inspection of a sample of Non-EQ low voltage low current or low load connections is representative, with reasonable assurance, of Non-EQ electrical cable connections within similar applications, circuit loading conditions, and environments. The technical basis for the sample selection will be documented. The acceptance criteria for each inspection are defined by the specific type of test being performed on the connections. An engineering evaluation will be performed when test acceptance criteria are not met. The evaluation will include identifying the extent of condition, the potential root cause for not meeting the test acceptance criteria, the likelihood of recurrence, and the need to expand the sample size and/or frequency of the inspection.

The staff finds this acceptable because an appropriate testing program is identified for low voltage, low current, or low load circuit connections.

The GALL Report also states that the location (e.g., high temperature, high humidity, etc.) should be considered for cable connection sampling. In the Electrical Cable Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, the applicant stated that the selected sample only includes the plant indoor environment. The staff requested that the applicant explain how the aging effect of loose connection or high resistance due to corrosion is not a potential aging effect requiring management for electrical cable connections in outdoor environment.

By letter dated August 31, 2007, the applicant amended LRA Section B2.1.26 to include electrical cable connections in outdoor environments.

The staff finds the applicant's response acceptable because the cable connections in outdoor environments are now included within the scope of this program and will be inspected. This environment is consistent with the GALL Report.

<u>Enhancement 1</u>. In the LRA, the applicant credited an enhancement to the GALL Report program element "corrective action" Specifically, the enhancement stated:

> Revise procedure I-ENG-005 to include an engineering evaluation that include identifying the extent of condition to determine if the situation is applicable to other in-scope Non-EQ electrical cable connections that are not part of the testing sample, the potential root cause for not meeting the test acceptance criteria and the likelihood of recurrence.

The staff finds the enhancement acceptable because it will make the applicant's corrective action element consistent with the GALL Report.

By letter dated August 31, 2007, the applicant amended LRA Section B2.1.26 to include the following enhancement:

Enhancement 2. In the LRA, the applicant credited an enhancement to the GALL Report program element "parameters monitored or inspected," "detection of aging effects," and "acceptance criteria." Specifically, the enhancement stated:

> A one-time inspection of a sample of low voltage low current or low load connections will be performed prior to the period of extended operation. The inspection will consist of contact resistance testing or other appropriate testing methods used to identify loosening of low voltage, low current, or low load connections.

The staff finds the enhancement acceptable because it will make the program consistent with the staffs' proposed changes to GALL AMP X1.E6 (Proposed License Renewal Interim Staff Guidance LR-ISG-2007-02). The one time inspection, on a representative sampling basis, is to ensure that aging of low voltage metallic cable connection is not occurring; hence, a periodic inspection is not required.

The staff reviewed those portions of the Electrical Cables Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, for which the applicant claims consistency with GALL AMP XI.E6 and finds that they are consistent with the GALL AMP. The staff finds the applicant's enhancements to Electrical Cables Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, acceptable because it is consistent with the changes as recommended in the staff LR-ISG-2007-02.

Operating Experience. LRA Section B2.1.36 states that infrared thermography has been performed routinely since 1989 on 189 electrical components. Plant-specific operating experience shows a small number of scans of electrical connections with thermal anomaly. The connections with these thermal anomalies were cleaned and re-tightened. The applicant stated that no loss of component intended function has occurred.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Electrical Cable Connections Not Subject to 10 CFR 50.49 Requirements Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the Electrical Cable Connections Not Subject to 10 CFR 50.49 Requirements Program and where the applicant had implemented corrective action. The staff finds that the operating experience did not reveal degradations that are not bounded by industry experience and verified that the applicant's corrective actions were timely and appropriate.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A1.36, the applicant provided the USAR supplement for the Electrical Cable Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program. The applicant committed (Commitment No. 20) to enhance the infrared thermograghy testing procedure to require an engineering evaluation when test acceptance criteria are not met. This engineering evaluation will include identifying the extent of condition, the potential root cause for not meeting the test acceptance, and the likelihood of recurrence. By letter dated October 11, 2007, the applicant revised this commitment to state that a one-time inspection of a representative sample of low voltage, low current, or low load connections will be performed prior to the period of extended operation. The staff reviewed this section and determines that the information in the USAR 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 Electrical Cable Connections Not Subject to 10 CFR 50.49, Environmental Qualification Requirements Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.24 Metal Fatigue of Reactor Coolant Pressure Boundary

Summary of Technical Information in the Application. LRA Section B3.1 describes the existing Metal Fatigue of Reactor Coolant Pressure Boundary Program as consistent, with enhancements, with GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary."

The Metal Fatigue of Reactor Coolant Pressure Boundary Program manages cumulative fatigue damage in metal components of the RCPB and analyzed Class 2 portions of the steam generators. The program software counts operating transient cycles, applies analytical methods to determine stress cycles and their contributions to fatigue usage factors, and tracks the resulting fatigue cumulative usage factors (CUFs). The software maintains a record of CUFs at bounding locations in Class 1 piping and vessels and in Class 2 steam generator parts with Class 1 analyses. The Metal Fatigue of Reactor Coolant Pressure Boundary Program scope includes applicable NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components," monitoring locations (with one exception for which the original fatigue analysis plus effects of the reactor coolant environment have been validated for the period of extended operation). The program will include applicable action limits for the NUREG/CR-6260 locations, allowances for environmental effects of the reactor coolant as determined by NUREG/CR-6583 and NUREG/CR-5704 or appropriate alternative methods, and action limits for the bases of the leak-before-break (LBB) analysis and of the high-energy line break (HELB) locations so they remain valid or appropriate corrective measures are taken.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancements, remains 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 Metal Fatigue of Reactor Coolant Pressure Boundary Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP X.M1.

Enhancement 1. In the LRA, the applicant credited an enhancement to the GALL Report program elements "detection of aging effects" and "corrective actions." Specifically, the enhancement stated:

> Action levels of the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to ensure that if the fatigue usage factor calculated by the code analysis is reached at any monitored location, appropriate evaluations and actions will be invoked to maintain the analytical basis of the LBB analysis and of the HELB locations, or to revise them as required.
>
> Action levels of the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to ensure that appropriate evaluations and actions will be invoked to maintain the bases of safety determinations that depend upon fatigue analyses, if the fatigue usage factor at any of the monitored NUREG/CR-6260 locations approaches 1.0 when multiplied by the environmental effect factor FEN.
>
> Action levels of the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to ensure that appropriate evaluations and actions will be invoked to maintain the bases of safety determinations that depend upon fatigue analyses, if the fatigue usage factor at any monitored location approaches 1.0.
>
> Corrective actions of Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to ensure that on approach to an action limit, an evaluation will determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations; to ensure that other locations do not approach the code limit without an appropriate action and that the bases of the LBB and HELB analyses are maintained.

The staff reviewed the fatigue management procedure listed in the audit summary. The staff did not find any action levels or corrective actions defined in the procedure. The staff requested that the applicant explain what it meant by action levels and corrective actions and where they are defined.

By letter dated October 3, 2007, the applicant amended this enhancement to:

(1) Include a cycle count action limit and corrective actions. An action limit will be established that requires corrective action when the cycle count for any of the critical thermal and pressure transients is projected to reach a high percentage (e.g., 90%) of the design specified number of cycles before the end of the next fuel cycle. If this action limit is reached, acceptable corrective actions include:

(a) Review of fatigue usage calculations:

- To determine whether the transient in question contributes significantly to CUF
- To identify the components and analyses affected by the transient in question
- To ensure that the analytical bases of the leak-before-break (LBB) fatigue crack propagation analysis and of the high-energy line break (HELB) locations are maintained.

(b) Evaluation of remaining margins on CUF based on cycle-based or stress-based CUF calculations using the WCGS fatigue management program software.

(c) Redefinition of the specified number of cycles (e.g., by reducing specified numbers of cycles for other transients and using the margin to increase the allowed number of cycles for the transient that is approaching its specified number of cycles).

(2) Include a cumulative fatigue usage action limit and corrective actions. An action limit will be established that requires corrective action when calculated CUF (from cycle based or stress based monitoring) for any monitored location is projected to reach 1.0 within the next 2 or 3 fuel cycles. If this action limit is reached, acceptable corrective actions include:

(a) Determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations. This determination will ensure that other locations do not approach design limits without an appropriate action.

(b) Enhance fatigue monitoring to confirm continued conformance to the code limit.

(c) Repair the component.

(d) Replace the component.

(e) Perform a more rigorous analysis of the component to demonstrate that the design code limit will not be exceeded.

(f) Modify plant operating practices to reduce the fatigue usage accumulation rate.

(g) Perform a flaw tolerance evaluation and impose component-specific inspections, under ASME Section XI Appendices A or C (or their successors), and obtain required approvals by the NRC.

Corrective action limits for cumulative fatigue usage will be established to assure that sufficient margin is maintained to allow one cycle of the highest fatigue usage per cycle transient to occur without exceeding CUF = 1.0. (This includes consideration of environmental effects for NUREG/CR6260 locations.) This may require that corrective action is taken more than 2 or 3 fuel cycles before CUF is projected to exceed 1.0.

This is because the projections will be based on historical experience, which is not expected to include many of the low probability design transients. The low probability design transients to be used in the evaluation will include:

- aux. spray actuation, spray water diff. >320 F
- excessive feedwater flow
- reactor trip - cooldown with no SI
- COMS
- reactor trip - no inadvertent cooldown with turbine over-speed
- reactor trip - cooldown with SI
- inadvertent RCS depressurization
- accumulator safety injection
- operating basis earthquake

(3) Include a 10 CFR 50 Appendix B procedural and record requirements.

The staff finds this response acceptable because appropriate action limits and associated corrective actions have been defined. The staff finds the enhancement acceptable because, when the enhancement is implemented, the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be consistent with the GALL Report.

Enhancement 2. In the LRA, the applicant credited an enhancement to the GALL Report Program element "confirmation process." Specifically, the enhancement stated:

> The WCGS Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to invoke Appendix B procedural and record requirements.

The staff finds that after implementation of this enhancement, the program element would be consistent with the GALL Report. On this basis, the staff finds this enhancement acceptable.

The staff reviewed those portions of the Metal Fatigue of Reactor Coolant Pressure Boundary Program for which the applicant claims consistency with GALL AMP X.M1 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program acceptable because it conforms to the recommended AMP, with the enhancements described.

Operating Experience. LRA Section B3.1 states that EPRI developed the methods of the existing fatigue monitoring programs for the industry in response to staff concerns that early-life operating cycles at some units caused fatigue usage factors to accumulate more rapidly than anticipated in design analyses. Therefore, the Metal Fatigue of Reactor Coolant Pressure Boundary Program was designed to ensure that the code would not be exceeded in the remainder of the licensed life. The operating experience program reviews applicable industry experience with fatigue monitoring for evaluation and incorporation into plant analyses and procedures. Any necessary evaluations are conducted under the plant corrective action program.

The staff finds that the program has remained responsive to emerging issues and concerns, particularly:

- Pressurizer surge and spray nozzle, hot leg surge nozzle, and surge line transients. This concern prompted operation with continuous spray during startup and shutdown transients and inclusion of these locations in the Metal Fatigue of Reactor Coolant Pressure Boundary Program.

- Axisymmetric thermal shock and thermal striping in the steam generator feedwater nozzles. Evaluation of low-flow transients in the feedwater (FW) nozzles raised concerns over transients driven by thermal instability under these conditions with possible thermal shock, thermal stratification bending, and skin-effect thermal striping. WCGS installed additional monitoring points for the fatigue monitoring system to collect data during operation and developed unique correlations ("transfer functions") to calculate these effects.

- Reduction and equalization of fatigue usage factor accumulation rate in charging nozzles. Westinghouse and WCGS found that operating practices where cycling flow through the active primary loop charging nozzle were performed more often than necessary and failed to use the two nozzles equally, causing fatigue usage to accumulate at a rate higher than that indicated by the code analysis. Operations modified procedures and practices to reduce cycling and to equalize it between the two charging nozzles. The Metal Fatigue of Reactor Coolant Pressure Boundary Program evaluated the nozzle CUF to date and now tracks fatigue in these nozzles.

Results of fatigue monitoring to date indicate that the number of design transient events assumed by the original design analysis is sufficient and that the design-basis fatigue CUF limit of 1.0 will not be exceeded at the monitored locations for a 60-year licensed operating period.

During the audit, the staff reviewed implementing procedures and problem identification reports related to the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program. The staff also interviewed selected onsite personnel who have specialized knowledge of the program. The staff reviewed instances previously documented by the applicant that identified issues with the Metal Fatigue of Reactor Coolant Pressure Boundary Program and where the applicant had implemented corrective action. The staff verified that the applicant's corrective actions were timely and appropriate.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A2.1, the applicant provided the USAR supplement for the Metal Fatigue of Reactor Coolant Pressure Boundary Program. The applicant committed (Commitment No. 21) to enhance the program. By letter dated October 3, 2007, as stated under the staff evaluation, enhancement 1, the applicant amended this commitment to include: (1) a cycle count action limit and corrective actions, (2) a cumulative fatigue usage action limit and corrective actions, and (3) 10 CFR 50, Appendix B, procedural and record requirements. The staff reviewed this section and determines that the information in the USAR 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 Metal Fatigue of Reactor Coolant Pressure Boundary Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.25 Environmental Qualification (EQ) of Electrical Components

Summary of Technical Information in the Application. LRA Section B3.2 describes the existing Environmental Qualification (EQ) of Electrical Components Program as consistent, with enhancement, with GALL AMP X.E1, "Environmental Qualification (EQ) of Electrical Components."

The Environmental Qualification (EQ) of Electrical Components Program manages component thermal, radiation, and cyclical aging by evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term must be refurbished or replaced or their qualifications extended prior to reaching the aging limits established in the evaluation. EQ component aging evaluations that specify a qualification of at least 40 years are considered time-limited aging analyses (TLAAs). The Environmental Qualification (EQ) of Electrical Components Program is consistent with 10 CFR 50.49, NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment," and RG 1.89, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," Revision 1, for maintenance of equipment qualification. Qualified components and their service requirements and environments are identified in controlled documents containing a master list of affected equipment, replacement and maintenance information, and local environment descriptions.

Staff Evaluation. During its audit, the staff reviewed the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains 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 Environmental Qualification (EQ) of Electrical Components Program, as listed in the audit summary, including the license renewal program evaluation report in which the applicant assessed whether the program elements are consistent with GALL AMP X.E1.

Enhancement. In the LRA, the applicant credited an enhancement to the GALL Report program element "acceptance criteria." Specifically, the enhancement stated:

> The program documents will be enhanced to describe methods that may be used for qualified life evaluations for the period of extended operation.

In LRA Section B3.2, the applicant states that components that are not qualified for the current license term must be refurbished or replaced or their qualifications extended prior to reaching the aging limits established in the evaluation. Furthermore, in the LRA, the applicant described the methods that may be used for extending qualified life evaluation. These methods include analytical methods, data collection and reduction methods, underline assumptions, and acceptance criteria and corrective actions. The applicant also stated that the Environmental Qualification (EQ) of Electrical Components Program is an existing program and, following enhancement, will be consistent with the GALL Report.

During the audit, the staff requested that the applicant explain methods that may be used for qualified life evaluation for the period of extended operation.

In its response, the applicant stated that LRA Sections A2.3 and B3.2, and Commitment No. 22 for Environmental Qualification (EQ) of Electrical Components Program will be amended to remove this enhancement. The current plant program methods will be used for qualified life evaluation during the period of extended operation.

The staff finds the applicant's response acceptable because the current Environment Qualification (EQ) of Electrical Component Program already includes methods for extending the qualified life of these electrical components pursuant 10 CFR 50.49. If the qualification life can not be extended, the environmentally qualified component will be replaced or refurbished.

By letter dated August 31, 2007, the applicant amended LRA Section B3.2 to delete this enhancement.

The staff reviewed those portions of the Environmental Qualification (EQ) of Electrical Components Program for which the applicant claims consistency with GALL AMP X.E1 and finds that they are consistent with the GALL AMP. The staff finds the applicant's Environmental Qualification (EQ) of Electrical Components Program acceptable because it conforms to the recommended AMP.

Operating Experience. LRA Section B3.2 states that the Environmental Qualification (EQ) of Electrical Components Program is consistent with 10 CFR 50.49, NUREG-0599, and RG 1.89 and considers operating experience for determining qualification bases and conclusions, including qualified life. Operating experience and system-, equipment-, or component-related information as reported through NRC Bulletins, INs, GLs, and 10 CFR Part 21 Notifications are evaluated for applicability. The applicant stated that when an emerging industry aging issue affects the qualification of an EQ component, the affected component is evaluated and appropriate corrective actions are taken. Any change to the qualification evaluations is documented in the affected EQ work packages with any applicable corrective actions. Issues addressing equipment aging are reconciled in sections that specifically document thermal-, radiation-, and cyclic-qualified lives.

During the audit, the staff requested that the applicant provides examples of operating experience that the Environment Qualification (EQ) of Electrical Components Program has succeeded in managing aging degradation in a timely manner. The staff also requested the applicant describe any corrective action or program enhancement as a result of these operating experiences.

In its response, the applicant stated that the preventive maintenance program manages age-related replacement and refurbishment of equipment, and surveillance activities based on a schedule dictated by the Environment Qualification Summary Document (EQSD) III. Any unexpected adverse conditions identified during operational and maintenance activities with regard to age degradation issues would be managed through the plant's corrective action program or by generating a work order that should be assigned to the program engineer. The environment qualification program engineer also reviews and evaluates industry operating experience and other sources of information (e.g., Scientec's monthly newsletter) for applicability to WCGS and, where necessary, implements the corrective actions.

The applicant also stated that no examples of age-related failure of environmentally qualified equipment was identified. Several examples of industry operating experience that were reviewed required no further action at WCGS.

The staff finds the applicant's response acceptable because the plant operating experience with the existing Environment Qualification (EQ) of Electrical Components Program shows that the implementation of this AMP has been successful managing age degradation.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A2.2, the applicant provided the USAR supplement for the Environmental Qualification (EQ) of Electrical Components Program. By letters dated May 25 and August 31, 2007, the applicant revised LRA Sections A2.2 and B3.2 to remove the stated enhancement and to delete Commitment No. 22. The staff reviewed this section and determines that the information in the USAR 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 (EQ) of Electrical Components Program, the staff determines 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.26 Concrete Containment Tendon Prestress

Summary of Technical Information in the Application. LRA Section B3.3 describes the existing Concrete Containment Tendon Prestress Program as consistent, with enhancements, with GALL AMP X.S1, "Concrete Containment Tendon Prestress."

The Concrete Containment Tendon Prestress Program manages the loss of tendon prestress in the post-tensioning system, which consists of inverted U-shaped tendons extending up through the basemat through the full height of the cylindrical walls and over the dome and of horizontal circumferential (hoop) tendons at intervals from the top of the basemat to about the 45-degree elevation of the dome. The basemat is conventionally reinforced. The tendons are ungrouted in grease-filled ducts.

Staff Evaluation. During its audit, the staff evaluated the applicant's claim of consistency with the GALL Report. The staff reviewed the enhancement to determine whether the AMP, with the enhancement, remains adequate to manage the aging effects for which it is credited.

Enhancement 1. In the LRA, the applicant credited an enhancement to the GALL Report program element "scope of program." Specifically, the enhancement stated:

> Procedures which list surveillance tendons will be extended to include random samples for the 40, 45, 50, and 55-year surveillances.

The staff reviewed LRA Section B3.3 and identified areas in which additional information was necessary to complete the review of the applicant's AMP. The applicant responded to the staff's RAIs as discussed below.

In RAI B3.3-1 dated April 10, 2007, the staff requested that the applicant discuss the differences between the enhanced procedures and the current procedures.

In its response, dated May 9, 2007, the applicant stated that the current procedures contain a list of specific tendons for each surveillance up to and including year 35. Tendons for surveillance have been selected in a random manner and are representative of the various types of tendons and conditions of exposure existing in containment. This enhancement only adds lists of additional randomly selected surveillance tendons for the 40, 45, 50 and 55-year surveillances. These additional surveillance tendons will be selected on the same basis as the surveillance tendons currently listed in the procedures for the intervals through year 35.

Based on its review, the staff finds the applicant's response to RAI B3.3-1 acceptable because it clarified that the enhancement is credited to include additional randomly selected surveillance tendons for the 40, 45, 50 and 55-year surveillances. Therefore, the staff's concern described in RAI B3.3-1 is resolved.

Enhancement 2. In the LRA, the applicant credited an enhancement to the GALL Report program elements "monitoring and trending," and "acceptance criteria." Specifically, the enhancement stated:

> Procedures will be enhanced to explicitly require a regression analysis for each tendon group after every surveillance; and to invoke and describe regression analysis methods used to construct the lift-off trend lines, including the use of individual tendon data in accordance with Information Notice (IN) 99 10, 'Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments.'

In RAI B3.3-2 dated April 10, 2007, the staff requested that the applicant discuss the differences between the current regression analysis method and the enhanced regression analysis method. The staff also requested that the applicant describe the regression analysis methods used to construct the lift-off trend lines.

In its response, dated May 9, 2007, the applicant stated that there is no difference for the regression analysis between the enhanced method for the period of extended operation and the current method and that the method is consistent with NRC IN 99-10, "Degradation of Prestressing Tendon System in Prestressed Concrete Containment."

Based on its review, the staff finds the applicant's response to RAI B3.3-2 acceptable because it clarified that the regression analysis method is consistent with NRC IN 99-10. Therefore, the staff's concern described in RAI B3.3-2 is resolved.

Enhancement 3. In the LRA, the applicant credited an enhancement to the GALL Report program element "monitoring and trending." Specifically, the enhancement stated:

> Surveillance program predicted force lines for the vertical and hoop tendon groups will be extended to 60 years.

The staff finds this enhancement acceptable because it will make the applicant's program elements consistent with the GALL Report.

Enhancement 4. In the LRA, the applicant credited an enhancement to the GALL Report program element "corrective actions." Specifically, the enhancement stated:

> Procedure descriptions of acceptance criteria action levels will be revised to conform to the ASME Code, Subsection IWL 3221 descriptions.

The staff finds this enhancement acceptable because it will make the applicant's corrective action program element consistent with the GALL Report.

Operating Experience. LRA Section B3.3 states that tendon inspections have shown no evidence of significant corrosion or other effects that might damage wires, no wire breakage (after initial installation), nor any accelerated loss of prestress due to high temperatures. The most recent 20-year surveillance results of the Concrete Containment Tendon Prestress Program include an examination and regression analysis of all tendon prestress surveillance data through the most recent inspection consistent with IN 99-10, Attachment 3, (i.e., use of individual-tendon data rather than averages); and therefore, incorporates the entire history of tendon prestress surveillance at this unit. The applicant stated that the surveillance found that loss of prestress in all tendons tested was less than that originally predicted. Extended to 60 years, the regression analysis demonstrated that prestress in both the vertical and horizontal ("hoop") tendon groups should remain above minimum required values for at least 60 years of operation and that all tendons should maintain their design-basis function without retensioning for the period of extended operation. Similarly, individual-tendon data from the "common tendons" (one vertical and one horizontal, the prestress of which is measured at each surveillance) or from other sample tendons tested to date show no loss of prestress sufficient to indicate any possible need for retensioning for at least 60 years. In addition, the applicant stated that the material conditions of other components (concrete, bearing surfaces, grease, buttonheads, etc.) showed only minor degradation in a few areas, none indicating any need for significant corrective action.

The staff reviewed instances previously documented by the applicant that identified issues with the Concrete Containment Tendon Prestress Program to determine whether the applicant had implemented timely and appropriate corrective action. The staff finds that the tendon inspections have shown no evidence of significant corrosion or other effects that might damage wires, no wire breakage, nor any accelerated loss of prestress due to high temperatures. The staff finds that there have been no incidents or material conditions requiring the need for corrective actions.

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; therefore, the staff finds this program element acceptable.

USAR Supplement. In LRA Section A2.3, the applicant provided the USAR supplement for the Concrete Containment Tendon Prestress Program. The applicant committed (Commitment No. 23) to enhance plant procedures to: (1) extend the list of surveillance tendons to include random samples for the year 40, 45, 50, and 55-year surveillances, (2) require a regression analysis for each tendon group after every surveillance, (3) invoke and describe regression analysis methods used to construct the lift-off trend lines, (4) extend surveillance program predicted force lines for the vertical and hoop tendon groups to 60 years, and (5) conform procedure descriptions of acceptance criteria action levels to the ASME Code, Subsection IWL 3221 descriptions. The staff reviewed this section and determines that the information in the USAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its review of the applicant's Concrete Containment Tendon Prestress Program, the staff determines that those program elements for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancement and confirms that their implementation prior to the period of extended operation would make the existing AMP consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 AMPs That Are Not Consistent with or Not Addressed in the GALL Report

In LRA Appendix B, the applicant identified the following AMPs as plant-specific:

- Nickel Alloy Aging Management Program
- Reactor Coolant System Supplement

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 Nickel Alloy Aging Management Program

Summary of Technical Information in the Application. LRA Section B2.1.34 describes the existing Nickel Alloy Aging Management Program as a plant-specific program.

The plant-specific Nickel Alloy Aging Management Program manages cracking due to PWSCC in all plant locations that contain Alloy 600, with the exception of steam generator tubing, including RCS pressure boundary, and non-pressure boundary, and ESF locations. Aging management requirements for nickel alloy penetration nozzles welded to the upper reactor vessel closure head noted in the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Program are included here for review convenience. The term "Alloy 600" used throughout this program represents Nickel Alloy 600 material and Nickel Alloy 82/182 weld metal. Non-Alloy 600 components, such as components made of Nickel Alloy 690 or Nickel Alloy 52/152, are not included in this program but are subject to ASME Code Section XI Inservice Inspection Program requirements.

The Nickel Alloy Aging Management Program uses inspections, mitigation techniques, repair, replacement, and monitoring of operating experience to manage Alloy 600 aging. Mitigation techniques are implemented preemptively when appropriate to remove conditions that contribute to PWSCC. Repair or replacement proactively removes or overlays Alloy 600 or corrects unacceptable flaws in the material. Mitigation and repair or replacement are consistent with the guidance of MRP-139. Operating experience was reviewed for the risk rankings of each Alloy 600 location. Operating experience is monitored continuously to improve and modify the Nickel Alloy Aging Management Program as needed.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B2.1.34 on the applicant's demonstration of the Nickel Alloy Aging Management 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 LRA Section B.2.1.34 and identified areas in which additional information was necessary to complete the review of the applicant's AMP. The applicant responded to the staff's RAIs as discussed below.

In RAI B2.1.34-2 dated April 11, 2007, the staff noted that PWSCC of components made of Alloy 600/82/182 in PWRs is an emerging material degradation issue. The industry has initiated augmented inspections and mitigation of susceptible components to ensure safe operation of the affected plants. Recent inspection findings of extensive circumferential cracking of Alloy 82/182 dissimilar metal welds at WCGS has raised concerns regarding the adequacy of the inspection scope and schedule based on industry initiatives. In addition, discussions with the industry to resolve the staff's comments and recommendations to the inspection program delineated in the Materials Reliability Program (MRP)-139, "Primary System Butt Weld Inspection and Evaluation Guideline," is continuing.

Therefore, to ensure that the program is acceptable for implementation during the period of extended operation and that the applicant will manage the effects of aging in accordance with 10 CFR 54.21(a)(3), the staff requested that the applicant commit to continue to participate in industry initiatives, such as the Westinghouse Owners Group and the EPRI MRP. The program inspection requirements of Alloy 600/82/182 components must be consistent with the latest version of the staff accepted industry guidance, generic communications, orders, and applicable regulatory requirements delineated in 10 CFR 50.55a. In addition, the staff requested that the applicant submit the AMP inspection plan for staff review and approval at least 24 months prior to entering the period of extended operation.

In its response, dated May 10, 2007, the applicant provided its commitment (Commitment No. 30). By letter dated October 11, 2007, the applicant modified this commitment to state:

> The WCNOC Nickel Alloy Aging Management Program will be supplemented with implementation of applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys, (2) staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, and (4) upon completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor coolant system nickel alloy pressure boundary components to the NRC for review and approval.

The staff finds the applicant's responses to RAI B2.1.34-2 acceptable because the applicant committed to continue to participate in industry initiatives, to incorporate inspection requirements consistent with the staff accepted guidance, and to submit the inspection plan for staff review and approval. The staff's concern described in RAI B2.1.34-2 is resolved.

In RAI B2.1.34-1 dated April 11, 2007, the staff noted that the Nickel Alloy Aging Management Program at WCGS was submitted prior to the performance of pre-mitigation weld inspections for the application of weld overlays on pressurizer connections with dissimilar metal butt welds. The pre-mitigation inspection performed in 2006 identified extensive circumferential cracking at three dissimilar metals welds associated with surge, relief, and safety nozzles.

The staff requested that the applicant revise this AMP to incorporate information pertaining to the dissimilar metals butt weld inspection activities and findings. The revised AMP should: (1) discuss program enhancements incorporated as a result of the inspections, (2) provide information regarding the mitigation and preventive actions, taken or planned, to reduce the susceptibility of Alloy 600/82/182 components to PWSCC, (3) discuss the inspection frequency and method of inspection of components susceptible to PWSCC covered under the scope of this program, and (4) provide justification that the AMP will provide reasonable assurance that PWSCC will be detected on a timely manner.

In its response, dated May 10, 2007, the applicant stated that the following changes to the plant's Alloy 600 program resulted from the circumferential cracking identified in 2006:

(1) Examinations have been added to the program as a result of the 2006 operating experience. Visual examination of bottom mounted nozzles are performed every other refueling outage. A baseline volumetric examination was performed during Refueling Outage 14 (Spring 2005) on all hot leg nozzles, cold leg nozzles and bottom mounted nozzles.

(2) Wolf Creek Nuclear Operating Corporation's (WCNOC) program provides for mitigation of reactor coolant system pipe butt welds containing alloy 600. Mitigation plans are prioritized in accordance with risk rankings listed in WCNOC Procedure "Program Plan for Management of Alloy 600 Components and Alloy 82/182 Welds," WCRE-15 Attachment A. Pressurizer surge, relief, safety, and spray nozzles containing alloy 600 material have been overlayed with alloy 690. WCNOC's program directs subsequent examinations of these nozzles to be performed in accordance with "Primary System Butt Weld Inspection and Evaluation Guideline," Materials Reliability Program (MRP-139). Options for mitigating reactor coolant loop nozzles are currently being evaluated.

(3) There have been no changes to the frequency or method of inspection other than those identified in (1) and (2) above.

(4) The WCNOC alloy 600 program provides reasonable assurance that primary water stress corrosion cracking (PWSCC) degradation will be detected in a timely manner because examination plans optimize inspection intervals and techniques, and maximize the likelihood of detecting a flaw prior to impact on plant safety and reliability. Alloy 600 inspection activities are included as augmented actions in the Inservice Inspection (ISI) program, and include bare metal visual (BMV), surface, and volumetric examinations as directed by regulatory and industry guidance. Inspection of components, where susceptible material is used as a pressure boundary for the primary system, meets or exceeds industry and regulatory guidance. The program incorporates plant-specific and industry operating experience. WCNOC has taken a proactive approach in mitigating the pressurizer nozzles via structural weld overlay and has included locations having susceptible material exposed to primary water in the Alloy 600 program. As part of this program WCNOC is considering available options for repairing/mitigating the reactor loop nozzles. This proactive approach applies to other high risk or high probability locations as well.

In addition, by letter dated July 26, 2007, the applicant amended the Nickel Alloy Aging Management Program described in LRA Section B2.1.34.

The staff reviewed the amended Nickel Alloy Aging Management Program against the AMP elements found in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1, focusing on how the program manages aging effects through the effective incorporation of 10 elements (i.e., "scope of the program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," "administrative controls," and "operating experience").

The applicant indicated that 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 documented in SER Section 3.0.4. Evaluation of the remaining seven elements follows:

(1) Scope of the Program - LRA Section B2.1.34 as amended, states with the exception of steam generator tubing, which is managed by the Steam Generator Tube Integrity Program, all Alloy 600 locations in plants systems such as RCS pressure boundary, RCS non-pressure boundary, and ESF locations are included within the scope of this program.

In RAI B2.1.34-6 dated April 11, 2007, the staff requested that the applicant identify all nickel Alloy 600 components that are within the scope of this program and its corresponding inspection plan.

In its response, dated May 10, 2007, the applicant provided a table which identified all Alloy 600 component locations in the reactor vessel, pressurizer, steam generator, reactor coolant piping and ESF.

During telephone conferences dated June 21, and August 17, 2007, the staff noted that the applicant's response required clarification. The staff requested that the applicant describe what kind of examinations will be performed at each component or weld location and clarify the meaning of the term generator maintenance.

In its responses dated July 26, and September 27, 2007, the applicant provided inspection methods and frequencies for these components. The applicant also defined the term generator maintenance and added footnotes in the component table to provide clarification and consistency.

The staff reviewed the table provided by the applicant and confirmed that, with the exception of steam generator tubing, all Alloy 600 components are included within the scope of this program.

The staff finds the applicant's responses to RAI B2.1.34-6 acceptable because it adequately described the nickel Alloy components that are within the scope of the AMP. The staff's concern described in RAI B2.1.34-6 is resolved.

The staff confirmed that the "scope of the program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1; therefore, the staff finds this program element acceptable.

(2) Preventive Actions - LRA Section B2.1.34, as amended, states that the program has many potential mitigation strategies that remove one or more of the three conditions that control PWSCC (i.e., susceptible material, tensile stress field, supporting environment). Mitigation activities that have been successfully performed at PWRs include weld overlays, replacement of Alloy 600 (as a pre-planned activity), and mechanical stress improvement process. Mechanical stress improvement process is a mechanical process that places the component surface in contact with the primary water in a compressive state, thereby removing the tensile which contribute to the initiation and growth of PWSCC.

The applicant stated that full structural weld overlays may be used either as a mitigation strategy or as a repair method. This method provides structural reinforcement at the (potentially) flawed location, such that adequate load-carrying capability is provided by the overlay. The considerations used by the Nickel Alloy Aging Management Program in selecting a mitigation strategy include availability of method, industry experience, plant location, risk evaluation, and pre-implementation activities.

The applicant stated that the program lists the recommended mitigation strategies for all of the Alloy 600 components. Mitigation strategies for several components must still be determined. Specific mitigation strategies will be determined by plant-specific and industry operating experience. The Water Chemistry Program provides preventive actions for monitoring and control of the supporting environment for PWSCC.

As previously discussed, in its response to RAI B2.1.34-1 dated May 10, 2007, the applicant stated that WCNOC has taken a proactive approach in mitigating the pressurizer nozzles via structural weld overlay and has included locations having susceptible material exposed to primary water in the Alloy 600 program.

During a telephone conference dated June 21, 2007, the staff requested that the applicant identify all the components of weld locations for which the proactive approach will be applied.

In its response dated July 26, 2007, the applicant stated that the proactive approach will apply to locations having susceptible material exposed to primary water in the Alloy 600 program. The approach uses mitigation strategies that occur before repair or replacement actions become mandatory. Currently, the applicant is considering available options for repairing or mitigating the reactor coolant loop nozzles. The applicant clarified that no other mitigation strategies are projected for the next 5 years; however, current locations may change over time based on plant and industry operating experience.

The applicant stated that a full structural weld overlay was applied to the following locations in the Fall of 2006 during Refueling Outage 15:

- pressurizer safety and relief nozzle safe-end weld
- pressurizer surge line nozzle safe-end weld
- pressurizer spray nozzle safe-end weld

The staff finds the applicant's response acceptable because it clarified how WCGS applies the proactive approach and listed the components to which a weld overlay was applied.

The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2; therefore, the staff finds this program element acceptable.

(3) Parameters Monitored or Inspected - LRA Section B2.1.34, as amended, states that the program utilizes various inspection and examination techniques for early detection of PWSCC in Alloy 600 components. The examination techniques include: (1) visual examination to detect evidence of leakage from pressure retaining components due to through wall cracking and discontinuities and imperfections on the surface of the component, (2) surface examinations to identify the presence of surface discontinuities,

and (3) volumetric examination to identify the presence of cracking and discontinuities throughout the volume of the materials.

In RAI B2.1.34-4 dated April 11, 2007, the staff noted that by letter dated July 27, 2004, the applicant responded to NRC Bulletin 2004-01, "Inspection of Alloy 82/182/600 Materials Used in the Fabrication of Pressurizer Penetrations and Steam Space Piping Connections at Pressurized Water Reactors." The staff requested that the applicant confirm that WCGS is not taking any exception to the guidance provided in this bulletin. The staff stated that if exceptions are identified, the applicant should address and justify them, especially those in the following areas: (1) percentage of inspection coverage to be achieved at each location, and (2) performance of an extent-of-condition evaluation, sample expansion, and non-destructive examinations if circumferential cracking is found. In addition, in view of the extensive PWSCC found at WCGS, the staff requested that the applicant discuss any enhancements made to the WCGS inspection plan for those components addressed in NRC Bulletin 2004-01.

In its response dated May 10, 2007, the applicant stated that the only exception taken to the recommendations of NRC Bulletin 2004-01 was approved by the staff as part of a relief request. The applicant clarified that the pressurizer surge, safety, relief and spray nozzles have been overlayed with Alloy 690. The pressure boundary in these locations is now the Alloy 690 overlay. The original Alloy 600 is no longer credited as the pressure boundary.

The staff finds the applicant's responses to RAI B2.1.34-4 acceptable because it clarified that the only exception taken the NRC Bulletin 2004-01 has been approved by the staff. The staff's concern described in RAI B2.1.34-4 is resolved.

In RAI B2.1.34-5 dated April 11, 2007, the staff noted that NRC Bulletin 2003-02, "Leakage from Reactor Pressure Vessel Lower Head Penetrations and Reactor Coolant Pressure Boundary Integrity," requested information from PWR licensees regarding the RCPB integrity associated with the RPV lower head penetrations. WCNOC did not discuss augmented inspection plans for these components in its response to this Bulletin nor in its description of the AMP. In view of the extensive PWSCC found at WCGS, the staff requested that the applicant discuss the inspection plan for the components addressed in NRC Bulletin 2003-02, and provide a justification for its adequacy.

In its response dated May 10, 2007, the applicant stated that in response to NRC Bulletin 2003-02, WCNOC performed bare metal visual examinations of the lower RPV head nozzles during the refueling outages in 2003 and 2005. In 2005, WCNOC also performed ultrasonic, eddy current and visual examinations of the bottom mounted nozzle welds from inside the vessel. No indications were found.

The applicant clarified that because the environmental conditions of the nozzles are similar to the closure head, which requires visual inspections every three refueling outages, WCNOC has chosen to reduce the frequency of the bare metal visual examinations of these nozzles from each refueling outage to every other refueling outage. Currently, WCNOC plans to conduct bare metal visual examinations, or a similar examination, every other refueling outage, with additional NDE exams (e.g., eddy current, ultrasonic, and visual) when the lower core barrel is removed for ISI exams.

The staff finds the applicant's responses to RAI B2.1.34-5 acceptable because the applicant addressed the actions taken in response to NRC Bulletin 2003-02. The staff finds that the applicant is adequately adjusting the exam frequency based on industry experience and guidance provided by the staff. The staff's concern described in RAI B2.1.34-5 is resolved.

In RAI B2.1.34-7 dated April 11, 2007, the staff requested that the applicant clarify if the equipment, method, and personnel used for these inspections meet the ASME Code, Section XI requirements.

In its response dated May 10, 2007, the applicant stated that the equipment, methods, and personnel used for Alloy 600 examinations are in accordance with NRC Order EA-03-009, ASME Code, Section XI, or the industry standard provided in MRP-139. The examination techniques used in each examination location are identified in the plant procedure AP 29A-007, "Alloy 600 Program Management," Step 6.4, and the requirements for each examination technique are described in WCNOC procedure "Program Plan for Management of Alloy 600 Components and Alloy 82/182 Welds," WCRE-15 Section 4.1.

The applicant provided the following summary of the requirements for equipment, methods, and personnel used for Alloy 600 examinations:

- VT-2 examinations are performed with procedures meeting the ASME Code Section XI requirements.

- Bare Metal Visual (BMV) examinations are performed using a procedure that meets the VT-2 requirements of ASME Section XI with the additional requirements that the surface of the component be visible. Remote video equipment is allowed but must be demonstrated to have the ability to fulfill detection requirements. Personnel performing the examinations must be qualified to a minimum of Level II in VT-2 method with additional training in the detection of Boric Acid Leakage/Corrosion.

- Surface Examinations are performed in accordance with ASME Code Section XI for method, equipment and personnel qualification requirements.

- The Code required volumetric examinations are in accordance with Appendix VIII of ASME Section XI.

- Non-Code required examinations are in accordance with the appropriate industry standard with equipment and procedure demonstrations as required. These are examinations required by NRC such as under head examinations as well as voluntary examinations of bottom mounted nozzles (BMN) which are performed using personnel, equipment, and procedures qualified by performance demonstrated methodology.

The staff finds the applicant's response to RAI B2.1.34-7 acceptable because it confirmed that the equipment, methods, and personnel used for the Alloy 600 examinations conforms to regulatory or industry requirements. The applicant also provided an adequate summary of the plant requirements for these Alloy 600 examinations. The staff's concern described in RAI B2.1.34-7 is resolved.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3; therefore, the staff finds this program element acceptable.

(4) Detection of Aging Effects - LRA Section B2.1.34, as amended, states that the program utilizes various visual, surface and volumetric inspection and examination techniques for early detection of PWSCC in Alloy 600 components. The applicant stated that three types of visual exams are used: (1) VT-2 exams which are conducted to detect evidence of leakage from pressure retaining components, (2) bare metal visual exams which are similar to VT-2 exams but require removal of insulation to allow direct access to the metal surface, and (3) visual exams which are conducted to assess the general condition of non-pressure boundary components.

The applicant stated that surface exams are used to indicate the presence of surface discontinuities and are conducted by liquid penetrant or eddy current methods. Volumetric exams indicate the presence of discontinuities throughout the volume of material and are conducted by radiographic, ultrasonic, or eddy current methods, or a combination.

The staff noted that the Nickel Alloy Aging Management Program was submitted by the applicant prior to the finding of significant circumferential cracking at three dissimilar metal welds. These welds are associated with the pressurizer surge, relief and safety nozzles. As previously discussed, in RAI B2.1.34-1 dated April 11, 2007, the staff requested that the applicant identify the changes made to the program as a result of such findings.

In its response dated May 10, 2007, the applicant stated that as a result of these findings visual examinations of bottom mounted nozzles are now performed every other refueling outage. The applicant also stated that a baseline volumetric examination on all hot leg nozzles, cold leg nozzles and bottom mounted nozzles was performed in 2005 during the Refueling Outage 14.

The applicant also stated that it implemented plans for mitigating RCS pipe butt welds containing Alloy 600. The mitigation plans are prioritized in accordance with risk rankings listed in WCRE-15, Attachment A. The inspection of these welds follows the guidance provided in MRP-139.

The applicant further stated that all Alloy 600 inspection activities are included as augmented action in the ISI program and that it is taking a proactive approach in mitigating the components susceptible to PWSCC.

The staff finds this is acceptable because the applicant has demonstrated that aging effects are being adequately detected and managed.

The staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4; therefore, the staff finds this program element acceptable.

(5) Monitoring and Trending - LRA Section B2.1.34, as amended, states that relative risk rankings for Alloy 600 locations are included as part of this program. The rankings were provided in a study conducted by Westinghouse and reflect conclusions based on WCGS data. The applicant stated that the risk rankings may be modified as additional information from the industry and WCGS is collected and analyzed. The Nickel Alloy Aging Management Program provides the requirements for examination frequencies. The examination frequencies are required by regulation, industry guidelines, and WCGS good practices.

In RAI B2.1.34-8 dated April 11, 2007, the staff requested that the applicant address how the relative risk rankings will be used in the inspection of Alloy600/82/182 components and whether this ranking methodology was approved by the NRC.

In its response dated May 10, 2007, the applicant stated that the ranking system is used to prioritize the expenditure of resources for mitigation, replacement, or additional inspections beyond regulatory and industry requirements. The initial relative risk ranking for Alloy 600/82/182 reactor coolant system locations at Wolf Creek is provided in WCAP 16228-P, "PWSCC Susceptibility Assessment of Alloy 600 and Alloy 82/182 Components in Wolf Creek."

During a telephone conference dated June 21, 2007, the staff noted that the applicant's response required clarification. The staff requested that the applicant describe the methodology and criteria used to apply the susceptibility ranking, describe the monitoring and mitigating program for the components in the various susceptibility categories, and discuss the assessment provided in WCAP 16228-P.

In its response dated July 26, 2007, the applicant stated that the relative risk rankings for PWSCC susceptibility at various Alloy 600 locations are based on the application of a phenomenological model that relates the kinetics or rate of crack initiation to the materials, manufacturing, and environmentally controlled parameter known to influence this mode of degradation. The relative risk rankings are developed from PWSCC susceptibility indices established in WCAP-16228-P. The applicant clarified that WCAP-16228-P is a proprietary document and has not been reviewed by staff. However, the applicant provided details on the mitigating program, monitoring program, and the relative risk ranking for each Alloy 600 location in its response to RAIs B2.1.34-1 and B2.1.34-6, dated July 26, 2007.

The staff finds acceptable the use of a model that uses the rate of crack initiation to produce risk rankings.

The staff finds the applicant's response to RAI B2.1.34-8 acceptable because it adequately explains the methodology and criteria used to apply the susceptibility ranking. The staff's concern described in RAI B2.1.34-8 is resolved.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5; therefore, the staff finds this program element acceptable.

(6) Acceptance Criteria - LRA Section B2.1.34, as amended, states that implementing procedures or work orders specify examination requirements and acceptance criteria in accordance with NRC Order EA-03-009 or ASME Code Section XI, or industry guidelines. The applicant stated that for components included in the MRP-139, it requires that all indications found during inspections must be evaluated in accordance with the ASME Code Section XI requirements and indications that do not satisfy the ASME Code IWB-3500 acceptance criteria must be dispositioned by analysis (such as IWB-3600), repaired or replaced.

The staff noted that NEI has provided the industry the guidance in MRP-139 regarding the inspection and evaluation of components with Alloy 82/182 butt welds. By letter dated October 12, 2005, the staff provided NEI its comments and recommendations regarding the subject report. The resolution of the staff comments and recommendations is continuing.

In RAI B2.1.34-3 dated April 11, 2007, the staff requested that the applicant identify the exceptions taken by WCNOC to the staff's comments and recommendations regarding the implementation of MRP-139.

In its response dated May 10, 2007, the applicant stated that it takes exception to two items:

(1) WCNOC may take exception to comment 2 with regard to the statement "that leak-before-break (LBB) welds shall be mitigated." Although WCNOC is pursuing plans to mitigate our LBB welds, definitive mitigation strategies and dates have not been set.

(2) WCNOC takes exception to comment 17. WCNOC does not interpret MRP-139 to permit volumetric coverage less than that required by the ASME code. WCNOC considers MRP Section 1.2 to be consistent with ASME code in that WCNOC does not interpret the guidelines set forth in 1.2 to reduce current ASME Code requirements.

The staff noted that the applicant is pursuing plans to mitigate the LBB welds. However, definitive mitigation strategies and dates have not been set. During a telephone conference dated June 21, 2007, the staff noted that the applicant's response required clarification. The staff requested that the applicant identify all the LBB nickel alloy welds at WCGS.

In its response dated July 26, 2007, the applicant stated that there are two welds; the reactor vessel outlet nozzle to safe-end weld (i.e., hot-leg) and the reactor vessel inlet nozzle to safe-end weld (cold leg).

The resolution of the staff comments and recommendations to MRP-139 is currently ongoing. However, the staff finds that the applicant's commitment (Commitment No. 30) to provide for staff review and approval, the Nickel Alloy Aging Management Program inspection plan two years prior to entering the period of extended operation. This commitment will provide an opportunity to the staff to ensure that the staff comments on the MRP-139 have been taken in consideration and have been properly incorporated. The staff finds that this provides reasonable assurance that the effects of aging will be managed during the period of extended operation.

The staff finds the applicant's response to RAI B2.1.34-3 acceptable because it clearly states the exceptions taken to the staff comments on the MRP-139. The staff has reasonable assurance that the applicant's commitment to provide the inspection plan for staff approval before the period of extended operation will ensure that the aging effects will be adequately managed. The staff's concern described in RAI B2.1.34-3 is resolved.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6; therefore, the staff finds this program element acceptable.

(10) Operating Experience - LRA Section B2.1.34, as amended, states that during the refueling outage in 2005, through-wall cracking in the Alloy 82/182 weld metal of the steam generator bowl drains was found. The weld metal was removed and replaced with Alloy 52 weld metal. This mitigation was performed on all four steam generators, even though cracking was found on only two of them.

During the refueling outage in 2006, circumferential indications were found on the pressurizer surge, relief, and safety nozzles-to-safe end dissimilar metal welds. Full structural weld overlays were applied to all of the pressurizer nozzles. The applicant stated that the Alloy 600 program was modified as a result from these flaws.

The applicant stated that the Alloy 600 program examination plans optimize inspection intervals and techniques, and maximize the likelihood of detecting a flaw prior to impact on plant safety and reliability. Alloy 600 inspection activities are included as augmented actions in the ISI program. Inspection of components where susceptible material is used as a pressure boundary for the primary system meets or exceeds industry and regulatory guidance. The program incorporates plant-specific and industry operating experience.

The applicant also stated that it has taken a proactive approach in mitigating the pressurizer nozzles via structural weld overlay and has included locations having susceptible material exposed to primary water in the Alloy 600 program.

The staff finds that the applicant adequately modified its Alloy 600 program to account for plant-specific operating experience with circumferential cracks. The applicant stated that: (1) visual examinations of bottom mounted nozzles are now performed every other refueling outage, (2) a baseline volumetric examination on all hot leg nozzles, cold leg nozzles and bottom mounted nozzles was performed in 2005, (3) mitigation plans are prioritized in accordance with risk rankings provided in the program and options for mitigating reactor coolant loop nozzles are currently being evaluated, and (4) pressurizer surge, relief, and safety nozzles containing Alloy 600 material have been overlayed with Alloy 690.

In RAI B2.1.34-9 dated April 11, 2007, the staff requested that the applicant provides details and examples regarding the implementation of correction actions related to the Nickel Alloy Aging Management Program.

In its response dated May 10, 2007, the applicant stated that the evaluations of the WCGS and industry operating experience have been documented in the corrective action program and improvements have been factored into the Alloy 600 program. In its response, the applicant provided several examples to demonstrate how the industry experience and guidance and the plant-specific operating experience were factored into the development of the Alloy 600 program.

The staff finds the applicant's response to RAI B2.1.34-9 acceptable because it demonstrates that the plant-specific and industry operating experience have been considered and applied to plant procedures and programs. The applicant demonstrated that the Alloy 600 program was modified to provide reasonable assurance that the aging effects in nickel alloy components will be adequately managed during the period of extended operation. The staff's concern described in RAI B2.1.34-9 is resolved.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10; therefore, the staff finds this program element acceptable.

The staff finds that the applicant addressed all the concerns raised by the staff and adequately amended the Nickel Alloy Aging Management Program to incorporate operating experience with circumferential crack at WCGS.

Based on its review, the staff finds that the Nickel Alloy Aging Management Program provides reasonable assurance that PWSCC degradation will be detected in a timely manner because the applicant's examination plans optimize inspection intervals and techniques, and maximize the likelihood of detecting a flaw prior to impact on plant safety and reliability.

USAR Supplement. In LRA Section A1.34, the applicant provided the USAR supplement for the Nickel Alloy Aging Management Program. By letters dated July 26, and August 31, 2007, the applicant amended LRA Sections B2.1.34 and A1.34, respectively, to incorporate plant operating experience. By letter dated October 11, 2007, the applicant amended Commitment No. 30 to state:

> The WCNOC Nickel Alloy Aging Management Program will be supplemented with implementation of applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, (4) upon completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor coolant system nickel alloy pressure boundary components to the NRC for review and approval.

The staff reviewed this section and finds the USAR supplement information is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Nickel Alloy Aging Management Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.2 Reactor Coolant System Supplement

Summary of Technical Information in the Application. LRA Section B2.1.35 describes the new Reactor Coolant System Supplement Program as a plant-specific program.

The plant-specific Reactor Coolant System Supplement Program supplements the Reactor Coolant System Nickel Alloy Pressure Boundary Components and the Rector Vessel Internals Programs with the following commitments in accordance with the recommendations of the SRP-LR, Section 3.1.

- Reactor Coolant System Nickel Alloy Pressure Boundary Components Program. Implement applicable NRC Orders, Bulletins, GLs, and staff-accepted industry guidelines associated with nickel alloys.

- Rector Vessel Internals Program. Participate in the industry programs for investigating and managing aging effects on reactor internals; evaluate and implement the results of the industry programs as applicable to the reactor internals; and submit an inspection plan for reactor internals to NRC, for review and approval, 24 months before entering the period of extended operation.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information in LRA Section B2.1.35 on the applicant's demonstration of the Reactor Coolant System Supplement Program to ensure 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 finds that this is a plant-specific program that only consists of a commitment (Commitment No. 19) related to RCS nickel alloy pressure boundary components and RVI. Therefore, it is not possible to utilize the AMP program elements found in SRP-LR Section A.1.2.3, and in SRP-LR Table A.1-1, to evaluate how the program manages the aging effects during the period of extended operation. Hence, the staff finds that this program can be considered as a supplement to the list of AMPs.

The staff noted that the Nickel Alloy Aging Management Program, described in LRA Section B2.1.34, was submitted by the applicant prior to the finding of significant circumferential cracking at three dissimilar metal welds. By letter dated July 26, 2007, the applicant amended the Nickel Alloy Aging Management Program to incorporate this operating experience. As a result, the commitment in the Reactor Coolant System Supplement Program was also amended.

The staff reviewed the commitment for the RCS nickel alloy pressure boundary components for compliance with applicable NRC Orders and USAR commitments. The staff determines that for these components, the applicant's commitment to implement applicable NRC Orders, Bulletins, GLs, and staff-accepted industry guidelines associated with nickel alloys is acceptable. The applicant committed to participate in industry initiatives, and to submit for staff review and approval, an inspection plan for these components 24 months before entering the period of extended operation.

The staff notes that the plant-specific Nickel Alloy Aging Management Program is credited to manage PWSCC in nickel alloy components. The staff's evaluation of the Nickel Alloy Aging Management Program is documented in SER Section 3.0.3.3.1.

The staff reviewed the commitment for the RVI. The staff finds that the applicant's commitment to participate in industry programs for investigating and managing aging effects on reactor internals is acceptable. The applicant also committed to evaluate and implement the results of these industry programs, and to submit for staff review and approval, an inspection plan for these components 24 months before entering the period of extended operation.

The staff finds that this supplement AMP provides commitments that follow the recommendations described in the GALL Report and, therefore is consistent with the staff review criteria.

USAR Supplement. In LRA Section A1.35, the applicant provided the USAR supplement for the Reactor Coolant System Supplement Program. By letter dated July 26, 2007, the applicant amended LRA Sections A1.35 and B2.1.35, and its commitment (Commitment No. 19) to state:

(1) Reactor Coolant System Nickel Alloy Pressure Boundary Components

Implement applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, (4) upon completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor coolant system nickel alloy pressure boundary components to the NRC for review and approval, and

(2) Reactor Vessel Internals

(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, WCNOC will submit an inspection plan for reactor internals to the NRC for review and approval.

The staff reviewed this section and determines that the information in the USAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Reactor Coolant System Supplement 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 USAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 Quality Assurance Program Attributes Integral to Aging Management Programs

Pursuant to 10 CFR 54.21(a)(3), the applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation. SRP-LR, BTP RLSB-1, "Aging Management Review – Generic," describes ten elements of an acceptable AMP. Elements (7), (8), and (9) are associated with the QA activities of "corrective actions," "confirmation process," and "administrative controls." BTP RLSB-1, Table A.1-1, "Elements of an Aging Management Program for License Renewal," provides the following description of these program elements:

(7) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(8) Confirmation Process – The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions are completed and effective.

(9) Administrative Controls – Administrative controls should provide for a formal review and approval process.

BTP IQMB-1, "Quality Assurance for Aging Management Programs," notes that AMP aspects that affect the quality of safety-related SSCs are subject to the QA requirements of 10 CFR Part 50, Appendix B. Additionally, for nonsafety-related SCs subject to an AMR, the applicant may use the existing 10 CFR Part 50, Appendix B, QA program to address the elements of "corrective actions," "confirmation process," and "administrative controls." BTP IQMB-1 provides the following guidance on the QA attributes of AMPs:

- Safety-related SCs are subject to 10 CFR Part 50, Appendix B, requirements which are adequate to address all quality-related aspects of an AMP consistent with the CLB of the facility for the period of extended operation.
- For nonsafety-related SCs that are subject to an AMR, an applicant has an option to expand the scope of its 10 CFR Part 50, Appendix B, program to include these SCs to address "corrective action," "confirmation process," and "administrative control" for aging management during the period of extended operation. In this case, the applicant should document such commitment in the USAR supplement in accordance with 10 CFR 54.21(d).

3.0.4.1 Summary of Technical Information in the Application

In LRA Section B.1.3, the applicant described the elements of "corrective action," "confirmation process," and "administrative controls" that are applied to the AMPs for both safety-related and nonsafety-related components. A single QA program is used which includes the elements of corrective action, confirmation process, and administrative controls. Corrective actions, confirmation, and administrative controls are applied in accordance with the plant's corrective action program regardless of the safety classification of the components. Specifically, in LRA Section B.1.3 the applicant stated that the QA program implements the requirements of 10 CFR Part 50, Appendix B. LRA Section B.2 provides a summary of AMPs.

3.0.4.2 Staff Evaluation

The staff reviewed the applicant's AMPs as described in LRA Appendices A and B. In addition, the staff reviewed each individual AMP basis document to ensure consistency in the use of the quality assurance attributes for each program. The purpose of this review was to assure that the aging management activities were consistent with the staff's guidance described in SRP-LR, Section A.2.

Based on the staff's evaluation, the descriptions and the applicability of the plant-specific AMPs and their associated quality attributes provided in LRA Section B1.3 were determined to be generally consistent with the staff's position regarding quality assurance for aging management. However, the applicant had not sufficiently described the use of the quality assurance program and its associated attributes (corrective action, confirmation process, and administrative controls) in LRA Appendix A. In addition, AMP program descriptions in LRA Sections B2.1.1 and B2.1.3, discussed "Exceptions to NUREG 1801," and indicated that corrective actions was an area to which an exception is being taken. However, there was no indication or description of the use of an alternative method to the WCGS 10 CFR Part 50, Appendix B, quality assurance program being applied to the area of corrective action.

The staff reviewed LRA Appendix B and identified an area in which additional information was necessary to complete the staff's review of the applicant's quality assurance program attributes. The applicant responded to the staff's RAI as discussed below.

In RAI 3.0.4-1 dated April 4, 2007, the staff requested that the applicant provides the following information to address these issues:

(1) A supplement to the description in LRA Section A1, to clearly indicate the application of the WCGS 10 CFR Part 50, Appendix B, quality assurance program, or an alternative, for the corrective action, conformation process, and administrative control attributes in each program. If any alternative approaches are identified to the application of the WCGS 10 CFR Part 50, Appendix B, quality assurance program, provide a description of sufficient detail such that the staff can determine if the quality attributes for the AMPs are consistent with the review acceptance criteria described in SRP-LR Section A.2

(2) For AMPs, as described in LRA Appendix B, which take exceptions in the area of corrective action, confirmation process, or administrative controls, indicate whether the exceptions include an alternative to the application of the WCGS 10 CFR Part 50, Appendix B, quality assurance program. If alternative approaches are identified, provide a description of sufficient detail such that the staff can determine if the quality attributes for the AMPs are consistent with the review of the acceptance criteria described in SRP-LR Section A.2.

In its response dated May 2, 2007, the applicant provided the following information:

(1) The applicant stated that LRA Section A1 will be revised to indicate the application of the WCNOC Quality Assurance Program to safety-related and nonsafety-related SSCs during the period of extended operation.

(2) The applicant stated that, the AMPs discussed in LRA Sections B.2.1.1 and B.2.1.3 address exceptions taken to the corrective actions program element (Element 7) of the GALL Report, Sections XI.M1 and XI.M3. Both of these program exceptions are general exceptions to program elements 1, 3, 4, 5, 6 and 7 due to the fact that the WCGS ASME Code Section XI ISI Program uses the ASME Code, 1998 Edition through the 2000 Addenda. GALL Report Sections XI.M1 and XI.M3 are based on the ASME Code, 2001 Edition through 2002 and 2003 Addenda. Corrective actions of the WCNOC QA plan apply to activities discussed in LRA Sections B.2.1.1 and B.2.1.3.

By letter dated August 31, 2007, the applicant amended LRA Section A1 to include a new introductory paragraph, as follows:

> A1 Summary Descriptions of Aging Management Programs:
>
> The integrated plant assessment and evaluation of time-limited aging analyses (TLAA) identified existing and new aging management programs necessary to provide reasonable assurance that components within the scope of License Renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. Sections A1 and A2 describe the programs and their implementation activities.
>
> Three elements common to all aging management programs discussed in Sections A1 and A2 are corrective actions, confirmation process, and administrative controls. These elements are included in the WCNOC Quality Assurance (QA) Program, which implements the requirements of 10 CFR 50, Appendix B and are applicable to the safety-related and nonsafety-related systems, structures and components that are subject to aging management review activities.

Based on its review, the staff finds the applicant's response to RAI 3.0.4-1 acceptable because the applicant indicated that the WCGS 10 CFR Part 50, Appendix B, QA program will be applied to the AMP criteria of "corrective action," "confirmation process" and "administrative controls" for safety-related and nonsafety-related SSCs subject to AMPs, during the period of extended operation. In addition, the applicant indicated that the exceptions taken in the area of corrective actions in the AMP program descriptions in LRA Sections B.2.1.1 and B.2.1.3 did not affect the commitment to apply the WCGS 10 CFR Part 50, Appendix B, program to the area of corrective action. The staff's concern described in RAI 3.0.4-1 is resolved.

3.0.4.3 Conclusion

On the basis of its review of the descriptions and applicability of the plant-specific AMPs and their associated quality attributes provided in LRA Sections B.1.3 and B.2 and the

RAI response, the staff finds that the applicant's approach is consistent with the staff's position regarding QA for aging management. The staff concludes that the QA attributes (corrective action, confirmation process, and administrative control) of the applicant's AMPs are consistent with the requirements of 10 CFR 54.21(a)(3).

3.1 Aging Management of Reactor Vessel, Reactor Vessel Internals, and Reactor Coolant System

This section of the SER documents the staff's review of the applicant's AMR results for the reactor vessel, RVI, and reactor coolant system components and component groups of:

- reactor vessel and internals
- reactor coolant system
- steam generators

3.1.1 Summary of Technical Information in the Application

LRA Section 3.1 provides AMR results for the reactor vessel, RVI, and reactor coolant system components and component groups. LRA Table 3.1.1, "Summary of Aging Management Evaluations in Chapter IV of NUREG-1801 for Reactor Vessel, Internals, and Reactor Coolant System," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the reactor vessel, RVI, and reactor coolant system components and component groups.

The applicant's AMRs evaluated and incorporated applicable plant-specific and industry operating experience in the determination of AERMs. The plant-specific evaluation included condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.1.2 Staff Evaluation

The staff reviewed LRA Section 3.1 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the reactor vessel, RVI, and reactor coolant system components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.1.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR 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 that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.1.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

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 Amendment	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 WCGS (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)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy RCPB piping, piping components, and piping elements exposed to reactor coolant (3.1.1-3)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	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 RVI 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)
Nickel Alloy tubes and sleeves in a reactor coolant and secondary FW/steam environment (3.1.1-6)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Fatigue is a TLAA (See SER Section 3.1.2.2.1)
Steel and stainless steel RCPB closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting (3.1.1-7)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	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 Amendment	Staff Evaluation
Steel; stainless steel; and nickel-alloy RCPB piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves (3.1.1-8)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	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)
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 3.1.2.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
Steel steam generator shell assembly exposed to secondary FW and steam (3.1.1-12)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.2.2.1)
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 3.1.2.2.2.2)
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 3.1.2.2.2.3)
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy RCPB components exposed to reactor coolant (3.1.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.2.3)
Steel steam generator upper and lower shell and transition cone exposed to secondary FW and steam (3.1.1-16)	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry and, for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed.	Yes	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 2 components (B2.1.1) and Water Chemistry (B2.1.2)	Consistent with the GALL Report (See SER Section 3.1.2.2.2, item (4))

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
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 (B2.1.15)	Consistent with the GALL Report (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 SCC and IGSCC	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.4.1)
Stainless steel isolation condenser components exposed to reactor coolant (3.1.1-20)	Cracking due to SCC and IGSCC	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.1.2.2.4.2)
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	TLAA	Crack growth due to cyclic loading is a TLAA (See SER Section 3.1.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
Stainless steel and nickel alloy RVI components exposed to reactor coolant and neutron flux (3.1.1-22)	Fatigue is a TLAA (See SER Section 3.1.2.2.1)	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but commitment to be confirmed	Reactor Coolant Supplement Program commitments (B2.1.35)	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 SCC	A plant-specific aging management program is to be evaluated.	Yes	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	Consistent with the GALL Report (See SER Section 3.1.2.2.7.1)
Class 1 CASS piping, piping components, and piping elements exposed to reactor coolant (3.1.1-24)	Cracking due to SCC	Water Chemistry and, for CASS components that do not meet the NUREG-0313 guidelines, a plant-specific AMP	Yes	Water Chemistry (B2.1.2) and ASME Code Section XI Inservice Inspection, Subsections IWB, IWC and IWD (B2.1.1)	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 3.1.2.2.8.1)
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 3.1.2.2.8.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
Stainless steel and nickel alloy RVI 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.	No, but commitment to be confirmed	Reactor Coolant Supplement Program commitments (B2.1.35)	Consistent with the GALL Report (See SER Section 3.1.2.2.9)
Steel steam generator FW impingement plate and support exposed to secondary FW (3.1.1-28)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to WCGS (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 Amendment	Staff Evaluation
Stainless steel RVI components (e.g., Upper internals assembly, rod guide control assembly guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures) (3.1.1-30)	Cracking due to SCC, IASCC cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but commitment to be confirmed	Reactor Coolant Supplement Program commitments (B2.1.35) and Water Chemistry (B2.1.2)	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 PWSCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and FSAR supplement commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	No, but commitment to be confirmed	Reactor Coolant Supplement Program commitments (B2.1.35), ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2) and Nickel Alloy Aging Management Program (B2.1.34)	Consistent with the GALL Report (See SER Section 3.1.2.2.13)
Steel steam generator FW 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 Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	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 Amendment	Staff Evaluation
Stainless steel and nickel alloy RVI 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.	No, but commitment to be confirmed	Reactor Coolant Supplement Program commitments (B2.1.35)	Consistent with the GALL Report (See SER Section 3.1.2.2.15)
Stainless steel and nickel alloy reactor CRD head penetration pressure housings (3.1.1-34)	Cracking due to SCC and PWSCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No, but commitment to be confirmed	Water Chemistry (B2.1.2) and ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	Consistent with the GALL Report (See SER Section 3.1.2.2.16.1)
Steel with stainless steel or nickel alloy cladding primary side components; steam generator upper and lower heads, tubesheets and tube-to-tube sheet welds (3.1.1-35)	Cracking due to SCC and PWSCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No, but commitment to be confirmed	Not applicable	Not applicable to WCGS (See SER Sections 3.1.2.1.1 and 3.1.2.2.16.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
Nickel alloy, stainless steel pressurizer spray head (3.1.1-36)	Cracking due to SCC and PWSCC	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	No, unless commitment needs to be confirmed	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with the GALL Report (See SER Section 3.1.2.2.16.2)
Stainless steel and nickel alloy RVI components (e.g., upper internals assembly, rod guide control assembly guide tube assemblies, lower internal assembly, CEA shroud assemblies, core shroud assembly, core support shield assembly, core barrel assembly, lower grid assembly, flow distributor assembly) (3.1.1-37)	Cracking due to SCC, PWSCC, IASCC cracking	Water Chemistry and FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	No, but commitment to be confirmed	Reactor Coolant Supplement Program commitments (B2.1.35) and Water Chemistry (B2.1.2)	Consistent with the GALL Report (See SER Section 3.1.2.2.17)
Steel (with or without stainless steel cladding) CRD return line nozzles exposed to reactor coolant (3.1.1-38)	Cracking due to cyclic loading	BWR Control Rod Drive Return Line Nozzle	No	Not applicable	Not applicable to PWRs
Steel (with or without stainless steel cladding) FW nozzles exposed to reactor coolant (3.1.1-39)	Cracking due to cyclic loading	BWR Feedwater Nozzle	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 Amendment	Staff Evaluation
Stainless steel and nickel alloy penetrations for CRD stub tubes instrumentation, jet pump instrumentation, standby liquid control, flux monitor, and drain line exposed to reactor coolant (3.1.1-40)	Cracking due to SCC, 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 SCC and IGSCC	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 SCC and IGSCC	BWR Vessel ID Attachment Welds and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel fuel supports and CRD assemblies CRD housing exposed to reactor coolant (3.1.1-43)	Cracking due to SCC and IGSCC	BWR Vessel Internals and Water Chemistry	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, CRD housing, nuclear instrumentation guide tubes (3.1.1-44)	Cracking due to SCC, IGSCC, IASCC 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 Amendment	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 SCC, IGSCC, IASCC cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	Not applicable	Not applicable to PWRs
Stainless steel and nickel-alloy RVI 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 SCC, IGSCC (for stainless steel only), and thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	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 SCC, IGSCC, IASCC 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
High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage (3.1.1-50)	Cracking due to SCC and IGSCC	Reactor Head Closure Studs	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 Amendment	Staff Evaluation
CASS jet pump assembly castings; orificed fuel support (3.1.1-51)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	Not applicable	Not applicable to PWRs
Steel and stainless steel RCPB (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems (3.1.1-52)	Cracking due to SCC, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	No	Bolting Integrity (B2.1.7)	Consistent with the GALL Report
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-Cycle Cooling Water System (B2.1.10)	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	Closed-Cycle Cooling Water System (B2.1.10)	Consistent with the GALL Report
CASS Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant > 250°C (> 482°F) (3.1.1-55)	Loss of fracture toughness due to thermal aging embrittlement	Inservice Inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	No	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	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 Amendment	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 WCGS (See SER Section 3.1.2.1.1)
CASS Class 1 piping, piping component, and piping elements and CRD pressure housings exposed to reactor coolant > 250°C (> 482°F) (3.1.1-57)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)
Steel RCPB external surfaces exposed to air with borated water leakage (3.1.1-58)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	No	Boric Acid Corrosion (B2.1.4)	Consistent with the GALL Report
Steel steam generator steam nozzle and safe end, FW nozzle and safe end, AFW nozzles and safe ends exposed to secondary FW/steam (3.1.1-59)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	No	Flow-Accelerated Corrosion (B2.1.6)	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 (B2.1.21)	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	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	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 Amendment	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	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	Consistent with the GALL Report
Steel reactor vessel flange, stainless steel and nickel alloy RVI 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	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1)	Consistent with the GALL Report (See Section 3.1.2.1.2)
Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components (3.1.1-64)	Cracking due to SCC, PWSCC	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	No	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	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 Amendment	Staff Evaluation
Nickel alloy reactor vessel upper head and CRD penetration nozzles, instrument tubes, head vent pipe (top head), and welds (3.1.1-65)	Cracking due to PWSCC	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	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1), Water Chemistry (B2.1.2), and XI.M11-A, Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (B2.1.5)	Consistent with the GALL Report
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 WCGS (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	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	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 Amendment	Staff Evaluation
Stainless steel, steel with stainless steel cladding Class 1 piping, fittings, pump casings, valve bodies, nozzles, safe ends, manways, flanges, CRD housing; pressurizer heater sheaths, sleeves, diaphragm plate; pressurizer relief tank components, reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings (3.1.1-68)	Cracking due to SCC	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2)	Consistent with the GALL Report (See SER Section 3.1.2.1.3)
Stainless steel, nickel alloy safety injection nozzles, safe ends, and associated welds and buttering exposed to reactor coolant (3.1.1-69)	Cracking due to SCC, PWSCC	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	No	For stainless steel components: ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1) and Water Chemistry (B2.1.2) For nickel alloy components: Nickel Alloy Aging Management (B2.1.34), ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD (B2.1.1) for Class 1 components, Water Chemistry (B2.1.2),Reactor Coolant Supplement Program (B2.1.35)	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 Amendment	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 SCC, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	No	ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD for Class 1 components (B2.1.1), Water Chemistry (B2.1.2) and One-Time Inspection Of ASME Code Class 1 Small-Bore Piping (B2.1.19)	Consistent with the GALL Report
High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage (3.1.1-71)	Cracking due to SCC; loss of material due to wear	Reactor Head Closure Studs	No	Reactor Head Closure Studs (B2.1.3)	Consistent with the GALL Report
Nickel alloy steam generator tubes and sleeves exposed to secondary FW/steam (3.1.1-72)	Cracking due to OD SCC and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	Consistent with the GALL Report
Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant (3.1.1-73)	Cracking due to PWSCC	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	Consistent with the GALL Report
Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary FW/steam (3.1.1-74)	Cracking due to SCC, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	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 Amendment	Staff Evaluation
Nickel alloy once-through steam generator tubes exposed to secondary FW/steam (3.1.1-75)	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)
Steel steam generator tube support plate, tube bundle wrapper exposed to secondary FW/steam (3.1.1-76)	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	Consistent with the GALL Report
Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary FW/steam (3.1.1-77)	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)
Steel steam generator tube support lattice bars exposed to secondary FW/steam (3.1.1-78)	Wall thinning due to flow-accelerate d corrosion	Steam Generator Tube Integrity and Water Chemistry	No	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)
Nickel alloy steam generator tubes exposed to secondary FW/steam (3.1.1-79)	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity; Water Chemistry and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with NRC Bulletin 88-02.	No	Steam Generator Tube Integrity (B2.1.8) and Water Chemistry (B2.1.2)	Consistent with the GALL Report (See SER Section 3.1.2.1.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	Further Evaluation in GALL Report	AMP in LRA, Supplements, or Amendment	Staff Evaluation
CASS RVI (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	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)
Nickel alloy or nickel-alloy clad steam generator divider plate exposed to reactor coolant (3.1.1-81)	Cracking due to PWSCC	Water Chemistry	No	Water Chemistry (B2.1.2)	Consistent with the GALL Report
Stainless steel steam generator primary side divider plate exposed to reactor coolant (3.1.1-82)	Cracking due to SCC	Water Chemistry	No	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy RVI and RCPB components exposed to reactor coolant (3.1.1-83)	Loss of material due to pitting and crevice corrosion	Water Chemistry	No	Water Chemistry (B2.1.2)	Consistent with the GALL Report
Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary FW/steam (3.1.1-84)	Cracking due to SCC	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	No	Not applicable	Not applicable to WCGS (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 Amendment	Staff Evaluation
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
Steel piping, piping components, and piping elements in concrete (3.1.1-87)	None	None	No	Not applicable	Not applicable to WCGS (See SER Section 3.1.2.1.1)

The staff's review of the reactor vessel, RVI, and reactor coolant system component groups followed any one of several approaches. One approach, documented in SER Section 3.1.2.1, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and require no further evaluation. Another approach, documented in SER Section 3.1.2.2, reviewed AMR results for components that the applicant indicated are consistent with the GALL Report and for which further evaluation is recommended. A third approach, documented in SER Section 3.1.2.3, reviewed AMR results for components that the applicant indicated are not consistent with or not addressed in the GALL Report. The staff's review of AMPs credited to manage or monitor aging effects of the reactor vessel, RVI, and reactor coolant system components is documented in SER Section 3.0.3.

3.1.2.1 AMR Results That Are 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, RVI, and reactor coolant system components:

- ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity
- Closed-Cycle Cooling Water System
- One-Time Inspection
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping

- External Surfaces Monitoring
- Lubricating Oil Analysis
- Nickel Alloy Aging Management
- Reactor Coolant System Supplement
- Flow-Accelerated Corrosion
- Flux Thimble Tube Inspection
- Reactor Head Closure Studs
- Reactor Vessel Surveillance
- Steam Generator Tube Integrity
- Nickel Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors

LRA Tables 3.1.2-1 through 3.1.2-3 summarize AMRs for the reactor vessel, RVI, and reactor coolant system components and indicate AMRs claimed to be consistent with the GALL Report.

For component groups evaluated in the GALL Report for which the applicant claimed consistency with the report and for which the GALL Report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also 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 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 verified whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff completed its audit and review of the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff verified 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

In LRA Table 3.1.1, the applicant states in items 35, 66, 75, and 84 that the corresponding AMR result lines in the GALL Report are not applicable because WCGS has recirculating steam generators rather than once-through steam generators.

The staff reviewed the documentation supporting the applicant's AMR evaluations and confirmed the applicant's statement that WCGS does not have once-through steam generators. The staff also confirmed that the corresponding AMR result lines in the GALL Report apply only for once-through steam generators. On the basis that WCGS does not have once-through steam generators, the staff agrees with the applicant's determination that these AMR result lines are not applicable to WCGS.

In LRA Table 3.1.1, item 56, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because WCGS has no copper alloy components with greater than 15 percent zinc exposed to closed cycle cooling water within the scope of license renewal.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that WCGS has no copper alloy components with greater than 15 percent zinc exposed to closed cycle cooling water that are within the scope of license renewal. On the basis that WCGS does not have this component and material combination, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to WCGS.

In LRA Table 3.1.1, item 57, the applicant states that the aging effect of loss of fracture toughness due to thermal aging embrittlement is not applicable for this material and environment combination at WCGS because the molybdenum and ferrite values for these components are below the industry accepted thermal aging embrittlement significance threshold (i.e., less than 0.5 percent molybdenum and less than 20 percent ferrite).

The staff reviewed GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," and found that 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 steels (i.e., 0.5 weight percent maximum), only static-cast steels with greater than 20 percent ferrite are potentially susceptible to thermal embrittlement. Static-cast low molybdenum steels with less than 20 percent ferrite and all centrifugal-cast low molybdenum steels are not susceptible.

The staff requested that the applicant provides the actual maximum molybdenum and ferrite values for the WCGS Class 1 CASS piping, piping components, piping elements, and control rod drive (CRD) pressure housings, and to provide copies of applicable certified material test reports for the staff review.

In its response, the applicant stated that the actual maximum molybdenum content is 0.35 percent and the actual maximum ferrite content is 19.5 percent.

The staff reviewed the applicant's certified material test reports and confirmed the maximum values as stated by the applicant. On the basis that the applicant's Class 1 CASS piping, piping components, piping elements, and control rode drive pressure housings are below the molybdenum and ferrite threshold limits for susceptibility to thermal aging embrittlement, the staff agrees with the applicant's determination that the aging effect of loss of fracture toughness due to thermal aging embrittlement is not applicable to WCGS and finds that the aging management evaluation result in the GALL Report, Volume 1, Table 1, item 57, is not applicable.

In LRA Table 3.1.1, item 77, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because WCGS does not use phosphate chemistry.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that WCGS does not use phosphate chemistry in the FW system. On the basis that WCGS does not have an environment of phosphate chemistry in the secondary FW or steam systems, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to WCGS.

In LRA Table 3.1.1, item 78, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because the WCGS steam generators do not contain lattice bars.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that the steam generators do not contain lattice bars. On the basis that WCGS does not have these components, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to WCGS.

In LRA Table 3.1.1, item 80, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because the WCGS reactor internals are forged stainless steel, not CASS.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that the WCGS reactor internals are forged stainless steel, not CASS. On the basis that WCGS does not use CASS as a material of construction for its internal components, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to WCGS.

In LRA Table 3.1.1, item 82, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because the primary side divider plates in the WCGS steam generators are made of nickel alloy.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that the primary side divider plates in the WCGS steam generators are made of nickel alloy. On the basis that the primary side divider plates in the steam generators are made of nickel alloy, not stainless steel, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to WCGS.

In LRA Table 3.1.1, item 87, the applicant states that the corresponding AMR result line in the GALL Report is not applicable because WCGS has no components in the reactor vessel, internals, and reactor coolant system within the scope of license renewal that are in concrete.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed the applicant's claim that WCGS has no components in the reactor vessel, internals, and reactor coolant system within the scope of license renewal that are in concrete. On the basis that the WCGS has no components in concrete in the reactor vessel, internals, and reactor coolant system within the scope of license renewal, the staff agrees with the applicant's determination that the corresponding AMR result line in the GALL Report is not applicable to WCGS.

3.1.2.1.2 Loss of Material Due to Wear

In LRA Table 3.1.1, item 63, the applicant states that the AMR result is consistent with the GALL AMP, with exceptions. The applicant further states that the AMP is the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD. The staff's evaluation of this AMP is documented in SER Section 3.0.3.2.1.

The staff reviewed the individual AMR result lines that reference LRA Table 3.1.1, item 63 and was unable to find an AMR result line for the lower internal assembly, radial keys, and inserts. The staff requested that the applicant clarify whether these components are subject to the aging effect of loss of material due to wear and whether the components are included within the scope of the ASME Code Section XI, Inservice Inspection, Subsections IWB, IWC, and IWD Program.

In its response, the applicant stated that the clevis insert bolts, radial keys, and the clevis inserts are subject to the aging effect of loss of material due to wear. The applicant stated that LRA Table 3.1.2-1 will be amended to include a new line for clevis insert bolts, radial keys, and clevis inserts made of nickel alloy in a reactor coolant environment. The line will reference an aging effect of loss of material that is managed by the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program. The applicant stated that the new component line in LRA Table 3.1.2-1 will refer to LRA Table 3.1.1, item 63, and GALL Report, item IV.B2-34.

By letter dated August 31, 2007, the applicant amended the LRA to add a new line into LRA Table 3.1.2-1. The new line adequately includes the components, material, aging effect, and AMP discussed.

The staff finds that the ASME Code Section XI Inservice Inspection, Subsection IWB, IWC, and IWD Program provides adequate management for the aging effect of loss of material due to wear. On the basis that the LRA amendment makes this AMR result line consistent with the GALL Report, the staff finds the applicant's response acceptable.

3.1.2.1.3 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Table 3.1.1, item 68 and found that there are components referring to this line in LRA Tables 3.1.2-2, 3.1.2-3, 3.2.2-10, 3.2.2-11, and 3.3.2-7. The staff noted that for most of these AMR results, the material is stainless steel, the environment is reactor coolant, the aging effect is cracking, and the AMPs credited are the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD and Water Chemistry Programs. However, in LRA Table 3.1.2-2, there are six lines where the component types are flow element, piping, pressurizer relief tank, rupture disc, thermowell, and valve, for which the results are consistent with the GALL Report. These six lines have an environment of treated borated water and the AMP credited is the Water Chemistry Program. For these six lines, the applicant applied note E, indicating that the component, material, environment, and aging effect are consistent with the GALL Report; however, the AMP is different from the one recommended in the GALL Report. The staff requested that the applicant clarify this inconsistency and explain the difference in the AMR results for the stainless steel components in a reactor coolant or treated water environment.

In its response, the applicant stated that the components for which the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program was not used are components that do not provide a RCPB function and that do not require inspection under the provisions of ASME Code Section XI. The applicant stated that these AMR result lines for non-ASME Code Section XI components should have been identified with GALL Report, item V.D1-31, where the material is stainless steel, the environment is treated borated water, the aging effect is cracking, and the recommended AMP is the Water Chemistry Program. The applicant stated that the LRA will be revised for these six items, to reference GALL Report, item V.D1-31, and LRA Table 3.2.2, item 48. The applicant stated that note B will be applied to these lines, indicating that the component, material, environment, aging effect, and AMP are consistent with the GALL Report; however, the AMP takes some exceptions to the GALL AMP. By letter dated August 31, 2007, the applicant adequately amended the LRA to make these changes (with adequate justifications to be consistent with the GALL Report).

The staff finds that the affected AMR result lines are consistent with the GALL Report. Based on their consistency with corresponding AMR result lines in the GALL Report, the staff finds the applicant's response acceptable.

3.1.2.1.4 Denting Due to Corrosion of Steel Tube Support Plate

In LRA Table 3.1.1, item 79, the applicant states that the use of ferritic stainless steel support plates is expected to prevent denting for the life of the steam generators; therefore, corrective actions consistent with NRC Bulletin 88-02 are not applicable to WCGS.

The staff reviewed NRC Bulletin 88-02 and determined that it is applicable for steam generators having carbon steel support plates. The staff found that the Westinghouse Model F steam generators in use by WCGS are not listed in the bulletin. On the basis that the actions described in NRC Bulletin 88-02 are not applicable for steam generators which use stainless steel support plates, the staff finds the AMR result line in the LRA to be consistent with the GALL Report and; therefore, 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 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 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.1.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the reactor vessel, RVI, and reactor coolant system components and provides information concerning how it will manage the following aging effects and related QA:

- 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 SCC and 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 stress corrosion cracking (IASCC)
- cracking due to PWSCC
- wall thinning due to flow-accelerated corrosion
- changes in dimensions due to void swelling
- cracking due to SCC and PWSCC
- cracking due to SCC, PWSCC, and 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 GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.1.2.2. 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).

In LRA Table 3.1.1, item 1, the applicant states that the AMR result line in the GALL Report is not used because WCGS has a Westinghouse reactor vessel and does not have a pressure vessel support skirt.

The staff reviewed the documentation supporting the applicant's AMR evaluation and confirmed that WCGS does not have a pressure vessel support skirt. On the basis that WCGS does not have a pressure vessel support skirt, the staff agrees with the applicant's determination that the AMR result line in the GALL Report is not applicable to WCGS.

In LRA Table 3.1.1, items 2, 3, and 4, the applicant states that the AMR result lines are not applicable.

The staff reviewed the corresponding AMR result lines in the SRP-LR and noted that they apply only to boiling water reactors (BWRs). On this basis, the staff agrees with the applicant's determination that LRA Table 3.1.1, items 2, 3, and 4, are not applicable, because WCGS is a PWR.

The staff noted that LRA Table 3.1.1, items 5 through 10, are AMR result lines with an aging effect of cumulative fatigue. SER Section 4.3 documents the staff's review of the applicant's evaluation of these TLAAs.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.1.2.2.2 against the following criteria in SRP-LR Section 3.1.2.2.2:

(1) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in PWR steam generator shell assembly exposed to FW and steam. The applicant stated that this aging effect is not applicable because WCGS has recirculating steam generators, not once-through steam generators; therefore, the applicable GALL Report line item was not used.

SRP-LR Section 3.1.2.2.2 specifies that loss of material due to general, pitting, and crevice corrosion may occur in the steel PWR steam generator shell assembly exposed to secondary FW and steam. Loss of material due to general, pitting, and crevice corrosion also may occur in the steel top head enclosure (without cladding) top head nozzles (vent, top head spray or reactor core isolation cooling (RCIC), and spare) exposed to reactor coolant.

In LRA Table 3.1.1, item 11, the applicant states that the line is not applicable because it applies to BWRs only.

The staff noted that this item applies to BWR systems and; therefore, is not applicable to WCGS because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

In LRA Table 3.1.1, item 12, the applicant states that WCGS has recirculating steam generators, not once-through steam generators; therefore, the applicable GALL Report line was not used.

The staff noted that GALL Report, item 12, is applicable only for once-through steam generators and that GALL Report, item 16, is used for recirculating steam generators with the same material, environment, and aging effect combination. On the basis that WCGS does not have once-through steam generators, the staff agrees with the applicant's determination that this line is not applicable to WCGS.

(2) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in BWR isolation condenser components exposed to reactor coolant. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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.

In LRA Table 3.1.1, item 13, the applicant states that the AMR result line is not applicable.

The staff reviewed the corresponding AMR result line in the SRP-LR and confirmed that it applies only to a BWR. On this basis, the staff agrees with the applicant's determination that LRA Table 3.1.1, item 13, is not applicable because WCGS is a PWR.

(3) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in reactor vessel components exposed to reactor coolant. The applicant stated that this section of the SRP-LR describing further evaluation is not applicable because WCGS is a PWR.

SRP-LR Section 3.1.2.2.2 specifies 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.

In LRA Table 3.1.1, items 14 and 15, the applicant states that these lines are not applicable because they apply only for BWRs.

The staff noted that the GALL Report, items 14 and 15, provide AMR results for components in a BWR reactor coolant environment, and GALL Report, item 83, provides AMR results for similar components in a PWR reactor coolant environment. On the basis of this review, the staff agrees with the applicant's determination that GALL Report, items 14 and 15, are applicable only to BWRs.

(4) LRA Section 3.1.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in steam generator shell and transition cone exposed to secondary FW and steam. The applicant stated that augmented inspection for loss of material is not applicable at WCGS because the steam generators at WCGS are Model F, and augmented inspection is recommended for Westinghouse Model 44 and 51 steam generators, if general and pitting corrosion of the shell exist due to the high stress in the shell to transition cone weld.

SRP-LR Section 3.1.2.2.2 specifies that loss of material due to general, pitting, and crevice corrosion may occur in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary FW and steam. The existing program controls chemistry to mitigate corrosion and ISI to detect loss of material. The extent and schedule of the existing steam generator inspections are designed to ensure that flaws cannot attain a depth sufficient to threaten the integrity of the welds; however, according to 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.

The staff confirmed that the WCGS steam generators are Westinghouse Model F. On this basis, the staff finds that the applicant's statement is consistent with the GALL Report and; therefore, is acceptable. The AMR result in the LRA states that the aging effect of loss of material due to general, pitting, and crevice corrosion will be managed by the ASME Code Section XI Inservice Inspection, Subsection IWB, IWC, and IWD and Water Chemistry Programs (without augment inspection). The staff finds the AMR result acceptable because it is consistent with the GALL Report (the staff's review criteria).

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.2 criteria.

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 criteria in SRP-LR Section 3.1.2.2.3:

(1) 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.

(2) LRA Section 3.1.2.2.3 addresses loss of fracture toughness due to neutron irradiation embrittlement. The applicant stated that the Reactor Vessel Surveillance Program manages this aging effect in carbon steel components clad with stainless steel exposed to reactor coolant. The last coupons examined were exposed to a fluence approximately equal to 54 effective full power years, the projected fluence through the period of extended operation. The examination of these coupons demonstrated that beltline materials will remain limiting, and that adequate adjusted reference temperature,

upper-shelf energy, and PTS screening temperature margin will remain at the end of the 60-year operating period. The applicant stated that subsequent revisions to pressure-temperature limits will provide adequate operating margin, without the use of special methods.

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 Section 3.2.2.3-1 states that since beltline materials remain limiting, nozzles were not evaluated separately.

The staff reviewed LRA Section 3.1.2.2.3-1 and identified an area in which additional information was necessary to complete the staff's review of the applicant's AMRs. The applicant responded to the staff's RAI as discussed below.

In RAI 3.1.2.2.3-1 dated April 9, 2007, the staff stated that in accordance with 10 CFR Part 50, Appendix H, Section III, if the end of life (EOL) peak neutron fluence exceeds 10^{17} n/cm^2 (i.e., E greater than 1 MeV) the material must be monitored through a surveillance program. The staff requested that the applicant confirm that the increase in peak 60-year EOL fluence for the nozzles will not exceed this value. The staff requested that the applicant provides appropriate data for the inclusion of nozzle materials in the surveillance program, or explain how the nozzle materials are adequately monitored by the proposed AMP.

In its response dated May 9, 2007, the applicant stated that the original selection of the limiting beltline material was made for an expected 32 EFPY peak beltline clad-based metal fluence of 3.14 x 10^{19} n/cm^2 (i.e., E greater than 1 MeV), before the change to low leakage cores. With low-leakage cores, the expected 54 EFPY peak fluence is 3.51 x 10^{19} n/cm^2 (i.e., E greater than 1 MeV), an increase of only 12 percent. The change is smaller than the 20 percent tolerance described in RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." Analysis of upper-shelf energy and reference temperature nil ductility transition (RT_{NDT}) values for the nozzles determines that the nozzle materials will not become limiting; therefore, they will be adequately monitored by the Reactor Vessel Surveillance Program.

The staff's evaluation of the applicant's response and Reactor Vessel Surveillance Program. The results of the staff's evaluation of the applicant's Reactor Vessel Surveillance Program is documented in SER Section 3.0.3.1.2. The results of the staff's evaluation of the applicant's reactor vessel neutron embrittlement TLAA is documented in SER Section 4.2. The staff noted that four capsules have been removed for testing. The capsule withdrawal schedule was revised by the removal of the last two capsules, at fluence exposures greater than those expected at the beltline wall at 60 years. The staff finds that this meets the ASTM E 185-82 criterion which states that capsules may be removed when the capsule neutron fluence is between one and two times the limiting fluence calculated for the vessel at the expected EOL. The staff finds that the surveillance specimens in the last capsule removed, Capsule X, were exposed to fluences equivalent to approximately 60 years (i.e., 54 EFPY) of vessel operation. On the basis of its review, the staff finds this acceptable.

The staff determines that the LRA correctly identifies WCGS 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 Tables 3.1.1 and 3.1.2-1 are consistent with the recommendations in the GALL Report.

Based on the program identified above, the staff concludes that the applicant's program meet SRP-LR Section 3.1.2.2.3 criteria. For those line items that apply to LRA Section 3.1.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.4 Cracking Due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.4 against the following criteria in SRP-LR Section 3.1.2.2.4:

(1) 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.

LRA Section 3.1.2.2.4 addresses cracking due to SCC and intergranular stress corrosion cracking (IGSCC) in BWR top head enclosure, vessel flange leak detection lines. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

The staff noted that this line item applies to BWR top head enclosures, vessel flange detection lines and; therefore, is not applicable to WCGS because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

(2) LRA Section 3.1.2.2.4 addresses cracking due to SCC and IGSCC in BWR isolation condenser components exposed to reactor coolant. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 noted that this line item applies to BWR isolation condenser components and; therefore, is not applicable to WCGS because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.4 criteria.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

LRA Section 3.1.2.2.5 indicates 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.

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. The applicant stated that this aging effect in nickel alloy and stainless steel reactor internals components exposed to reactor coolant will be managed by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) submitting an inspection plan for reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

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 RVI components exposed to reactor coolant and neutron flux. The GALL Report recommends no further AMR if the applicant commits in the final safety analysis report (USAR) supplement (1) to participate in industry programs for investigating and managing aging effects on reactor internals, (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals, and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

The staff finds that, for the RVI, the applicant committed (Commitment No. 19) to: (1) participate in 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) submit an inspection plan for the reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff finds that, for the RCS nickel alloy pressure boundary components, the applicant committed (Commitment No. 19) to: (1) implement applicable NRC Orders, Bulletins and GLs associated with nickel alloys, (2) implement applicable staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, and (4) submit an inspection plan for RCS nickel alloy pressure boundary components to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff's evaluation of the applicant's commitment provided in the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. The staff finds that this commitment is acceptable to manage the aging effects in the nickel alloy and stainless steel reactor internals components. The staff finds that this commitment is consistent with the recommendations in the GALL Report; therefore, no further AMR evaluation is necessary.

Based on the program identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.6 criteria. For those line items that apply to LRA Section 3.1.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.7 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.1.2.2.7 against the following criteria in SRP-LR Section 3.1.2.2.7, as a part of the staff's audit of the applicant's AMR/AMP:

(1) LRA Section 3.1.2.2.7 addresses cracking due to SCC in PWR stainless steel reactor vessel flange leak detection lines. The applicant stated that for managing this aging effect in stainless steel components exposed to reactor coolant, the Water Chemistry Program will be augmented by the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to ensure that adequate inspection methods detect cracks.

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.

The staff noted that the LRA includes only one AMR result line that references LRA Table 3.1.1, item 23, where the material is stainless steel in a reactor coolant environment and the aging effect is cracking due to stress corrosion. However, the SRP-LR discussion and the GALL Report include two AMR result lines that refer to GALL Report, item 23. The GALL Report identifies the first as bottom-mounted guide tubes components and the second as closure head, vessel flange leak detection line components. The staff noted that the LRA components in the AMR result line are identified as reactor vessel penetrations (i.e., instrument tubes (top head), and high pressure conduits). The staff requested that the applicant clarify whether the components identified in the LRA are the same as the components listed in the GALL Report and justify any differences.

In its response, the applicant stated that the high pressure conduits are the guide tubes that enclose the flux thimble tubes from the bottom of the vessel, and provide a pressure boundary function for the reactor coolant; they are the same as the components called bottom-mounted guide tubes in the GALL Report. The applicant stated that the instrument tubes (top head) are stainless steel instrument lines attached to vessel head penetrations, but they do not include the vessel flange leak detection line. The applicant stated that the vessel flange leak detection line (i.e., O-ring leak monitoring tube) is included in LRA Table 2.3.1-1; however, it is made of nickel alloy and therefore is not evaluated under GALL Report, item 23, where the material is stainless steel.

The applicant stated that the AMR result line for the vessel flange leak detection line references LRA Table 3.1.1, item 65, and credits the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD, the Water Chemistry, and the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors Programs.

The staff requested, as a part of the staff's audit of the applicant's AMR/AMP, that the applicant clarify whether there are any nickel alloy welds associated with the bottom-mounted instrument guide tubes and, if so, to identify where the AMR results for those welds are presented in the LRA.

In its response, the applicant stated that there are nickel alloy welds associated with the bottom-mounted instrument guide tubes, including the J-groove welds of the flux thimble guide tube penetrations to the vessel bottom and the welds of the flux thimble guide tube penetrations to the bottom-mounted instrument guide tubes. The applicant stated that these welds are included in the AMR results for reactor vessel penetrations (i.e., flux thimble guide tube penetrations), which references LRA Table 3.1.1, item 31, for the aging effect of cracking due to primary water stress corrosion, and LRA Table 3.1.1, item 83, for the aging effect of loss of material due to pitting and crevice corrosion.

The staff finds the applicant's response acceptable because the nickel alloy welds associated with the bottom-mounted instrument guide tubes have been included in the AMR results provided in the LRA. The staff's evaluation of the AMPs credited by the applicant to manage the aging effects in vessel flange leak detection line are documented in SER Sections 3.0.3.2.1, 3.0.3.2.2, and 3.0.3.2.5, respectively.

However, the staff noted that the title of LRA Section 3.1.2.2.7.1, "PWR stainless steel reactor vessel flange leak detection lines," appears to be inconsistent with the applicant's response because the title implies that the reactor vessel flange leak detection line is made of stainless steel.

In its response, the applicant stated that the title of LRA Section 3.1.2.2.7.1 and the note in LRA Table 3.1.1, item 23, would be amended to remove the inconsistency and provide clarification.

By letter dated August 31, 2007, the applicant amended the LRA as follows:

> The title of LRA Section 3.1.2.2.7.1 was changed to read, "PWR stainless steel reactor vessel instrument tubes and bottom-mounted flux thimble guide tubes."

The discussion column of LRA Table 3.1.1, item 3.1.1.23, was changed to state that the reactor vessel O-ring lead monitoring tubes are made of nickel alloy.

Based on the applicant's response, the staff determines that the LRA includes AMR results for all the components referenced in GALL Report, item 23. For the WCGS bottom-mounted instrument guide tubes and other vessel instrument tubes, which are made of stainless steel and in a reactor coolant environment, the staff finds that the applicant's use of the Water Chemistry Program, along with the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is adequate to manage the aging effect of cracking due to SCC. The staff finds that the Water Chemistry Program provides mitigation of the aging effect, and the ASME Code Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program provides ongoing confirmation of the effectiveness of the Water Chemistry Program.

On the basis that the LRA includes AMR results for all components described in the GALL Report, item 23, and in SRP-LR Subsection 3.1.2.2.7.1, and that the Water Chemistry and the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Programs are suitable to manage the aging effect of cracking in stainless steel components in a reactor coolant environment, the staff finds the applicant's AMR result for the affected components acceptable. The staff finds that the AMPs credited by the applicant include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage aging effect of cracking due to SCC in stainless steel bottom-mounted instrument guide tubes and other stainless steel vessel instrumentation tubes.

(2) LRA Section 3.1.2.2.7 addresses cracking due to SCC in CASS reactor coolant system piping and components exposed to reactor coolant. The applicant stated that for managing this aging effect in CASS piping components exposed to reactor coolant, the Water Chemistry Program will be augmented by the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program to ensure that adequate inspection methods detect cracks. The CASS in the RCS piping at WCGS meets the NUREG-0313 requirements for ferrite content but not for carbon content. A flaw evaluation methodology for CASS components is not necessary because CASS piping at WCGS is not susceptible to thermal aging embrittlement. Based on a review of Certified Material Test Reports, the molybdenum and ferrite values for these components are below the industry accepted thermal aging embrittlement significance threshold (less than 0.5 percent molybdenum, less than 20 percent ferrite).

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.

The staff noted that for Class 1 piping and piping components made of CASS, the GALL Report recommends: (a) monitoring and control of primary water chemistry in accordance with the guidelines of EPRI TR-105714 (Revision 3 or later) to minimize the potential for SCC, and (b) material selection in accordance with NUREG-0313, Revision 2, guidelines, which specify a maximum carbon content of 0.035 percent and a minimum ferrite content of 7.5 percent. For CASS components that do not meet either the maximum carbon or the minimum ferrite guideline, the GALL Report recommends a plant-specific AMP that should include: (a) adequate inspection methods to ensure detection of cracks, and (b) flaw evaluation methodology for CASS components that are susceptible to thermal aging embrittlement.

In LRA Table 3.1.1, item 24, the applicant states that the aging effect of cracking due to SSC in CASS piping exposed to reactor coolant will be managed using the Water Chemistry Program. The LRA states that this program will be augmented with the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program because the CASS in the reactor coolant system piping does not meet the limit for maximum carbon content specified in NUREG-0313.

The staff requested, as a part of the staff's audit of the applicant's AMR/AMP, that the applicant provides the actual carbon content of the CASS piping at WCGS and describe the ASME Code Section XI examinations used for the CASS piping.

In its response, the applicant stated that the carbon content of CASS piping at WCGS is in the range of 0.05 to 0.08 percent, which is above the 0.035 percent maximum carbon content limit specified in NUREG-0313. The applicant also stated that ASME Code Section XI examinations of CASS piping welds are performed in accordance with the examination requirements of ASME Code Section XI, Table IWB-2500-1, Examination Category B-J, items B9.10 and B9.11, which require surface and volumetric examinations. The applicant stated that volumetric examination is performed using UT because it is a proven industry technique for detection of weld and adjacent base metal cracking caused by SCC.

The staff's evaluation of the applicant's Water Chemistry, and ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.2.1, respectively. On the basis of its evaluations of these programs, the staff finds that the applicant's use of the Water Chemistry Program augmented by the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD Program is consistent with the recommendations in the GALL Report for a plant-specific program that includes adequate inspection methods to ensure detection of cracks.

In LRA Section 3.1.2.2.7.2, the applicant states that the molybdenum and ferrite content of the Class 1 CASS piping, piping components, and piping elements are below the thermal aging embrittlement threshold.

The staff requested, as a part of the staff's audit of the applicant's AMR/AMP, that the applicant provides the actual maximum molybdenum and ferrite values for the WCGS Class 1 CASS piping, piping components, and piping elements, and provide copies of applicable certified material test reports for the staff review.

In its response, the applicant stated that the actual maximum molybdenum content is 0.35 percent and the actual maximum ferrite content is 19.5 percent. The staff reviewed the applicant's certified material test reports and confirmed the values as stated by the applicant. From the reports, the staff also noted that the CASS pipes, but not the pipe fittings, were fabricated using a centrifugal casting method.

The staff assessed the susceptibility of the WCGS Class 2 CASS piping to thermal aging embrittlement using the guidance in GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)." The GALL Report states that 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 steels (i.e., 0.5 weight percent maximum), only static-cast steels with greater than 20 percent ferrite are potentially susceptible to thermal embrittlement. Static-cast low molybdenum steels with less than or equal to 20 percent ferrite and all centrifugal-cast low molybdenum steels are not susceptible.

On the basis that the applicant's Class 1 CASS piping, piping components, and piping elements are below the molybdenum and ferrite threshold limits for susceptibility to thermal aging embrittlement, the staff finds that a flaw evaluation methodology for CASS components is not necessary, and the AMPs credited by the applicant are acceptable. The AMR result for the affected components is consistent with the recommendations of the GALL Report.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.7 criteria. For those line items that apply to LRA Section 3.1.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.8 Cracking Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.8 against the following criteria in SRP-LR Section 3.1.2.2.8:

(1) LRA Section 3.1.2.2.8 addresses cracking due to cyclic loading in BWR jet pump sensing lines. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 noted that this line item applies to BWR jet pump sensing lines and; therefore, is not applicable to WCGS because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

(2) LRA Section 3.1.2.2.8 addresses cracking due to cyclic loading in BWR isolation condenser components exposed to reactor coolant. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 noted that this line item applies to BWR isolation condenser components and; therefore, is not applicable to WCGS because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.8 criteria.

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. The applicant stated that loss of preload due to stress relaxation for nickel alloy and stainless steel reactor internals components exposed to reactor coolant will be managed by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) submitting an inspection plan for reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

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 RVI screws, bolts, tie rods, and hold-down springs exposed to reactor coolant. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement (1) to participate in the industry programs for investigating and managing aging effects on reactor internals, (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals, and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

The staff finds that, for the RVI, the applicant committed (Commitment No. 19) to: (1) participate in 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) submit an inspection plan for the reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff finds that, for the RCS nickel alloy pressure boundary components, the applicant committed (Commitment No. 19) to: (1) implement applicable NRC Orders, Bulletins and GLs associated with nickel alloys, (2) implement applicable staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, and (4) submit an inspection plan for RCS nickel alloy pressure boundary components to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff's evaluation of the applicant's commitment provided in the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. The staff finds that this commitment is acceptable to manage the aging effects in the nickel alloy and stainless steel reactor internals components. The staff finds that this commitment is consistent with the recommendations in the GALL Report; therefore, no further AMR evaluation is necessary.

Based on the program identified above, the staff concludes that the applicant's program 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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.10 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 loss of material due to erosion. The applicant stated that this aging effect is not applicable because WCGS does not have impingement plates.

SRP-LR Section 3.1.2.2.10 states that loss of material due to erosion may occur in steel steam generator FW impingement plates and supports exposed to secondary FW.

The staff confirmed that WCGS uses Westinghouse Model F steam generators, which do not have FW impingement plates. On the basis that WCGS does not have FW impingement plates, the staff agrees with the applicant's determination that this AMR result in the SRP-LR and in the GALL Report is not applicable to WCGS.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.10 criteria.

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 due to flow induced vibration. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.1.2.2.11 states that cracking due to flow induced vibration could occur in the BWR stainless steel steam dryers exposed to reactor coolant.

The staff noted that this line item applies to BWR steam dryers and; therefore, is not applicable to WCGS because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.1.2.2.11 criteria.

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. The applicant stated that for managing this aging effect in stainless steel reactor internals components exposed to reactor coolant, water chemistry will be augmented by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) submitting an inspection plan for reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

SRP-LR Section 3.1.2.2.12 states that cracking due to SCC and IASCC may occur in PWR stainless steel reactor internals exposed to reactor coolant. The existing program controls water chemistry to mitigate these aging effects. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement (1) to participate in the industry programs for investigating and managing aging effects on reactor internals, (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals, and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

The staff finds that, for the RVI, the applicant committed (Commitment No. 19) to: (1) participate in 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) submit an inspection plan for the reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff's evaluation of the applicant's commitment provided in the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. The staff finds that this commitment is acceptable to manage the aging effects in the stainless steel reactor internals components. The staff finds that this commitment is consistent with the recommendations in the GALL Report; therefore, no further AMR evaluation is necessary.

Based on the program identified above, the staff concludes that the applicant's program 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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.13 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. The applicant stated that for managing this aging effect in nickel alloy components exposed to reactor coolant, water chemistry and ISI will be augmented by the plant-specific Nickel Alloy Aging Management Program, and by implementing applicable (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.

SRP-LR Section 3.1.2.2.13 states that cracking due to PWSCC may occur in PWR components made of nickel alloy and steel with nickel alloy cladding, including RCPB components and penetrations inside the reactor coolant system such as pressurizer heater sheathes and sleeves, nozzles, and other internal components. Except for reactor vessel upper head nozzles and penetrations, the GALL Report recommends ASME Code Section XI ISI (for Class 1 components) and control of water chemistry. However, for nickel alloy components, no further AMR is necessary if the applicant complies with applicable NRC orders and commits in the FSAR supplement to implement applicable (1) bulletins and generic letters, and (2) staff-accepted industry guidelines.

The staff finds that, for the RVI, the applicant committed (Commitment No. 19) to: (1) participate in 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) submit an inspection plan for the reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff finds that, for the RCS nickel alloy pressure boundary components, the applicant committed (Commitment No. 19) to: (1) implement applicable NRC Orders, Bulletins and GLs associated with nickel alloys, (2) implement applicable staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, and (4) submit an inspection plan for RCS nickel alloy pressure boundary components to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff's evaluation of the applicant's commitment provided in the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. The staff finds that this commitment is acceptable to manage the aging effects in the nickel alloy and stainless steel reactor internals components. The staff finds that this commitment is consistent with the recommendations in the GALL Report; therefore, no further AMR evaluation is necessary.

The staff also reviewed the applicant's Nickel Alloy Aging Management Program which is credited to manage PWSCC. The staff's evaluation of the Nickel Alloy Aging Management Program is documented in SER Section 3.0.3.3.1. The staff finds that this program will adequately manage the aging effects in nickel alloy components so that the intended functions will be maintained consistent with the CLB during the period of extended operation.

The staff finds that, similar to the commitment (Commitment No. 19) provided by the applicant in the Reactor Coolant System Supplement Program, the Nickel Alloy Aging Management Program commitment (Commitment No. 30) implements: (1) NRC Orders, Bulletins and GLs associated with nickel alloys, (2) staff-accepted industry guidelines, and (3) participation in industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing PWSCC. In addition, the staff finds that the applicant will submit the Nickel Alloy Aging Management Program inspection plan to the NRC, for its review and approval, 24 months before entering the period of extended operation.

The staff finds that this commitment provides reasonable assurance that an acceptable AMP will be implemented and that the aging effects will be adequately managed during the period of extended operation.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.14 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 due to flow-accelerated corrosion. The applicant stated that feedring wall thinning was described in NRC IN 91-19. Evaluation of this condition is not applicable to WCGS and no action is required; however, the Water Chemistry and the Steam Generator Tube Integrity Programs are conservatively credited to manage wall thinning due to flow-accelerated corrosion for the feedring.

SRP-LR Section 3.1.2.2.14 states that wall thinning due to flow-accelerated corrosion may occur in steel FW inlet rings and supports. The GALL Report references IN 91-19, "Steam Generator Feedwater Distribution Piping Damage," for evidence of flow-accelerated corrosion in steam generators and recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting wall thinning due to flow-accelerated corrosion.

The staff reviewed NRC IN 91-19 and noted that it describes a problem with Combustion Engineering steam generator designs which are not used at WCGS. The staff also noted that the applicant credits the Water Chemistry and the Steam Generator Tube Integrity Programs to manage the aging effect of wall thinning in the FW ring, should it occur in the Westinghouse designed steam generators at WCGS.

The staff noted that the description of the Steam Generator Tube Integrity Program in the LRA and in the GALL Report does not indicate that the steam generator FW ring is within the scope of the AMP. The staff requested that the applicant clarify whether the scope of this AMP provides for inspections of the FW ring to manage loss of material (i.e., wall thinning) due to flow-accelerated corrosion.

In its response, the applicant stated that the scope of its Steam Generator Tube Integrity Program is consistent with NEI 97-06, "Steam Generator Program Guidelines," which recommends that secondary side components that are susceptible to degradation be monitored if their failure could affect the intended function of the steam generator. The applicant stated that its Steam Generator Tube Integrity Program includes the FW rings and J-tubes as part of the secondary side inspections and that the program provides instructions for visual inspections of the upper steam drum, including FW ring and J-tubes on, at least, one steam generator at each refueling outage.

The staff's evaluation of the applicant's Water Chemistry and Steam Generator Tube Integrity Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.2.8, respectively. Based on the staff's evaluation of these programs and the additional information describing secondary side component inspections provided in the applicant's response, the staff finds that the applicant's Water Chemistry Program provides mitigation and the applicant's Steam Generator Tube Integrity Program provides detection for the aging effect of wall thinning. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage the aging effect of wall thinning due to flow-accelerated corrosion in the FW ring during the period of extended operation.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.15 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 dimensions due to void swelling. The applicant stated that changes in dimensions due to void swelling for nickel alloy and stainless steel reactor internals components exposed to reactor coolant will be managed by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) submitting an inspection plan for reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

SRP-LR Section 3.1.2.2.15 states that changes in dimensions due to void swelling may occur in stainless steel and nickel alloy PWR internal components exposed to reactor coolant. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement (1) to participate in the industry programs for investigating and managing aging effects on reactor internals, (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals, and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

The staff finds that, for the RVI, the applicant committed (Commitment No. 19) to: (1) participate in 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) submit an inspection plan for the reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff finds that, for the RCS nickel alloy pressure boundary components, the applicant committed (Commitment No. 19) to: (1) implement applicable NRC Orders, Bulletins and GLs associated with nickel alloys, (2) implement applicable staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, and (4) submit an inspection plan for RCS nickel alloy pressure boundary components to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff's evaluation of the applicant's commitment provided in the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. The staff finds that this commitment is acceptable to manage the aging effects in the nickel alloy and stainless steel reactor internals components. The staff finds that this commitment is consistent with the recommendations in the GALL Report. Therefore, no further AMR evaluation is necessary.

Based on the program identified above, the staff concludes that the applicant's program 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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.16 Cracking Due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

The staff reviewed LRA section 3.1.2.2.16 against the criteria in SRP-LR Section 3.1.2.2.1.16:

(1) LRA Section 3.1.2.2.16 addresses cracking due to SCC and PWSCC in steam generator heads, tubesheets, and welds made or clad with stainless steel. The applicant stated that these CRD mechanism and pressurizer components are stainless steel for WCGS. Therefore, no additional commitments or further evaluation is required.

SRP-LR Section 3.1.2.2.16 states that cracking due to SCC may occur on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds made or clad with stainless steel. Cracking due to PWSCC may occur on the primary coolant side of PWR steel steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds made or clad with nickel alloy. The GALL Report recommends ASME Code Section XI ISI and control of water chemistry to manage this aging effect and recommends no further AMR for PWSCC of nickel alloy if the applicant complies with applicable NRC orders and commits in the FSAR supplement to implement applicable (1) bulletins and generic letters, and (2) staff-accepted industry guidelines.

The staff noted that the SRP-LR and the GALL Report, items 34 and 35, refer to the further evaluation discussion in SRP-LR Section 3.1.2.2.16.1. Item 34 applies to stainless steel and nickel alloy CRD head penetration pressure housings. Item 35 applies to steel with stainless steel or nickel alloy cladding primary side components of once-through steam generators (i.e., steam generator upper and lower heads, tubesheets, and tube-to-tube sheet welds). For both items, the recommended AMPs are the "Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry, and for nickel alloy, FSAR supplement commitment to implement applicable plant commitments to: (1) NRC orders, bulletins, and generic letters associated with nickel alloys, and (2) staff-accepted industry guidelines." For both items, the statement in the further evaluation column of the SRP-LR and the GALL Report is, "No, but applicant commitment needs to be confirmed."

During its review of LRA Section 3.1.2.2.16.1, the staff noted that the title of the Section refers only to steam generator components. However, the text discusses CRD mechanisms and pressurizer components, not steam generator components. The staff requested that the applicant clarify this discrepancy.

In its response, the applicant stated that the title of LRA Section 3.1.2.2.16.1 will be revised to include the CRD head penetration pressure housings. The applicant also stated that the discussion should not have included pressurizer components, and that the text in the LRA will be revised to delete mention of pressurizer components and to add a statement that WCGS has recirculating steam generators, not once-through steam generators, and that the further evaluation for the steam generator components is not applicable to WCGS.

By letter dated August 31, 2007, the applicant amended LRA Section 3.1.2.2.16.1 to state:

> 3.1.2.2.16.1 Cracking on Steam Generator Heads, Tube Sheets, Control Rod Drive Head Penetration Pressure Housings and Welds
>
> These control rod drive mechanism housings are stainless steel for WCGS; therefore, no additional commitments or further evaluation is required. WCGS has a recirculating steam generator, not a once-through steam generator; so the further evaluation for steam generator components is not applicable to WCGS.

The staff finds the LRA amendment acceptable because it eliminates an inconsistency between the title (labeling) of LRA Section 3.1.2.2.16.1 and its discussion. The staff finds that this is consistent with the further evaluation discussion in the SRP-LR.

The staff noted that in the LRA, one AMR result line refers to LRA Table 3.1.1, item 34. This AMR result is for the reactor vessel CRD head penetrations (i.e., flange, cap, latch housing, rod travel housing) construction is stainless steel, not nickel alloy. The staff requested that the applicant clarify whether the CRD head penetration pressure housings include nickel alloy welds and, if so, clarify where the AMR results for those nickel alloy welds are presented in the LRA.

In its response, the applicant stated that there are Alloy 82/182 welds in the CRDM housings to the CRDM penetration tubes. Also, there are Alloy 82/182 J-groove welds in the CRDM penetration tubes to the lower surface of the vessel head. The applicant stated that aging management of these welds is evaluated in LRA Table 3.1.2-1, as part of the CRDM penetration tubes that are made of nickel alloys. The applicant stated that the AMPs credited to manage the aging effect of cracking are the ASME Code Section XI Inservice Inspection, Subsection IWB, IWC, and IWD, the Water Chemistry, and the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactor Programs. The AMP that manages the aging effect of loss of material is the Water Chemistry Program.

The staff reviewed the applicant's response and details of the applicant's AMR evaluations and found no omissions with regard to materials of construction for these components. The staff's evaluation of the ASME Code Section XI Inservice Inspection, Subsection IWB, IWC, and IWD, Water Chemistry, and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactor Programs is documented in SER Sections 3.0.3.2.1, 3.0.3.2.2, and 3.0.3.2.5, respectively.

On the basis of its evaluation of the specified AMPs, the staff finds the applicant's use of the ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD and the Water Chemistry Programs to manage the aging effects in the stainless steel CRDM housing components acceptable. The staff also finds the use of the Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactor Program to manage the aging effects in Alloy 82/182 welds in the CRDM housings acceptable. The staff confirmed that for the reactor coolant system nickel alloy pressure boundary components, the applicant committed (Commitment No. 19) to implement applicable NRC Orders, Bulletins and GLs associated with nickel alloys, and staff-accepted industry guidelines. On the basis that the LRA provides aging management for stainless steel components, and that the applicant has included the recommended commitment related to aging management of nickel alloy pressure boundary components as recommended in the GALL Report, the staff finds that the AMR results are acceptable.

(2) LRA Section 3.1.2.2.16 addresses cracking due to SCC and PWSCC in pressurizer spray head cracking. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage this aging effect in stainless steel components exposed to reactor coolant. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations). In addition, the applicant stated that WCGS does not have nickel alloy pressurizer spray heads within the scope of license renewal.

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 GALL Report recommends one-time inspection to confirm that cracking has not occurred. For nickel alloy welded spray heads, the GALL Report recommends no further AMR if the applicant complies with applicable NRC orders and commits in the FSAR supplement to implement applicable (1) bulletins and generic letters, and (2) staff-accepted industry guidelines.

The staff noted that there are two AMR result lines referring to LRA Table 3.1.1, item 36. The components listed on those lines are non-pressure boundary piping and valves, made of stainless steel, in an environment of reactor coolant, with the aging effect of cracking that will be managed by the Water Chemistry and the One-Time Inspection Program. For these lines, the applicant applied note D indicating that the components are different, but the material, environment, and aging effect is consistent with the GALL Report. The note also indicates that the AMPs credited take some exceptions to the recommendations in the GALL Report. The staff requested that the applicant clarify whether the pressurizer spray head is included in these lines.

In its response, the applicant stated that the pressurizer spray head is not safety-related, that it is not a pressure boundary component, and that it is used to support normal operation. Its function is not credited in any design basis events. The applicant stated that on this basis, the pressurizer spray head is not included within the scope of license renewal and is not subject to an AMR pursuant to 10 CFR Part 54.

The staff reviewed the applicant's response and the Westinghouse topical report WCAP-14574-A, "Licensing Renewal Evaluation: Aging Management Evaluation for Pressurizers," which was found acceptable by the NRC as documented in a safety evaluation dated October 26, 2000. The staff noted that the topical report is applicable for the WCGS pressurizer and that in the topical report, the pressurizer spray head was determined to be outside of the scope of license renewal and, therefore, does not require an AMR pursuant to 10 CFR Part 54. The staff's evaluation of the pressurizer spray head scoping and screening results is documented in SER Section 2.3.1.2.2. On the basis that the pressurizer spray head is not within the scope of license renewal and that this determination has been justified satisfying the scoping and screening guidance, the staff finds the applicant's response acceptable.

The staff noted that for the non-pressure boundary piping and valves that refer to LRA Table 3.1.1, item 36, the applicant stated that the aging effect of cracking due to SCC or PWSCC will be managed by the Water Chemistry and the One-Time Inspection Programs. The staff's evaluations of these AMPs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively.

Based on its evaluation of the specified AMPs and on the consistency of the material, environment, and aging effect with other AMR result lines in the GALL Report, the staff finds the applicant's use of the Water Chemistry and the One-Time Inspection Programs to manage these aging effects acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.1.2.2.16 criteria. For those line items that apply to LRA Section 3.1.2.2.16, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.17 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. The applicant stated that for managing this aging effect in nickel alloy and stainless steel reactor internals components exposed to reactor coolant, water chemistry will be augmented by (1) participating in the industry programs for investigating and managing aging effects on reactor internals; (2) evaluating and implementing the results of the industry programs as applicable to the reactor internals; and (3) submitting an inspection plan for reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

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 RVI 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 RVI components. The GALL Report recommends no further AMR if the applicant commits in the FSAR supplement (1) to participate in the industry programs for investigating and managing aging effects on reactor internals, (2) to evaluate and implement the results of the industry programs as applicable to the reactor internals, and (3) upon completion of these programs, but not less than 24 months before entering the period of extended operation, to submit an inspection plan for reactor internals to the staff for review and approval.

The staff finds that, for the RVI, the applicant committed (Commitment No. 19) to: (1) participate in 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) submit an inspection plan for the reactor internals to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff finds that, for the RCS nickel alloy pressure boundary components, the applicant committed (Commitment No. 19) to: (1) implement applicable NRC Orders, Bulletins and GLs associated with nickel alloys, (2) implement applicable staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, and (4) submit an inspection plan for RCS nickel alloy pressure boundary components to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff's evaluation of the applicant's commitment provided in the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. The staff finds that this commitment is acceptable to manage the aging effects in the nickel alloy and stainless steel reactor internals components. The staff finds that this commitment is consistent with the recommendations in the GALL Report, therefore, no further AMR evaluation is necessary.

Based on the program identified above, the staff concludes that the applicant's program meets 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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.18 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 3.1.2-3, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.1.2-1 through 3.1.2-3, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

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, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation - Reactor Vessel and Internals – 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 and internals component groups.

The staff noted that the AMR results for the reactor vessel nozzles, reactor vessel shell, and reactor vessel shell head components that are made of carbon steel with stainless steel cladding, and that are exposed to an environment of reactor coolant have an aging effect of crack growth due to cyclic loading. In the LRA, the applicant stated that at WCGS, evaluation of crack growth in these components is not a TLAA, as defined in 10 CFR 54.3. The applicant applied note I for these AMR results, indicating that the aging effect in the GALL Report for this component, material, and environment combination is not applicable to WCGS.

In LRA Section 3.1.2.2.5, the applicant stated that there are no plant-specific analysis of underclad flaw growth in the reactor vessel forgings at WCGS. Therefore, there are no such TLAAs. The applicant also stated that the Westinghouse topical report, WCAP-15338-A, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants," provides evaluation of growth of possible underclad flaws in PWRs and demonstrates that for a 60-year design life "... flaw growth is insignificant for any type flaw which might exist at the clad-base metal interface..." The applicant further stated that, since the evaluation was originally performed for the period of extended operation rather than for the current licensed operating period, this analysis is not a TLAA, in accordance with 10CFR 54.3(a).

The staff noted that WCAP-15338-A has been found acceptable for all Westinghouse RPVs and has been approved by the staff as a reference in LRAs, as documented in the revised safety evaluation for WCAP-15338, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants." The staff requested that the applicant clarify whether WCAP-15338-A is being credited in the LRA for evaluation of underclad flaws at WCGS.

In its response, the applicant stated that the NRC safety evaluation of WCAP-15338-A notes that "Underclad cracks... have been reported... only in SA-508, Class 2 reactor vessel forgings manufactured to a coarse grain practice and clad by high-heat-input submerged arc processes," and that in the WCGS vessel, the carbon steel forgings are SA-508, Class 2 or 3. The applicant also stated that although the vessel contains SA-508 forgings clad by high-heat-input processes, the cladding weld process was qualified in accordance with the recommendations of RG 1.43, Revision 0, "Control of Stainless Steel Weld Cladding of

Low-Alloy Steel Components," as described in USAR Section 5.3.1.2.g and USAR Appendix 3A. Therefore, the applicant concluded that underclad cracking should not occur at WCGS. The applicant stated that no underclad flaws have been detected or analyzed for the WCGS reactor vessel. Therefore, WCAP-15338-A has not been invoked for evaluation of underclad flaws at WCGS.

The applicant noted that the applicability of WCAP-15338-A at WCGS is discussed in LRA Section 4.7.2, "Absence of a TLAA for Reactor Vessel Underclad Cracking Analysis." LRA Section 4.7.2 states that WCAP-15338-A could be applied to WCGS because the cyclic and transient load assumptions of the topical report bound those expected in the WCGS vessel during the period of extended operation. The assessment states that, if invoked, WCAP-15338-A would be valid for the period of extended operation.

On the basis that the WCGS cladding process was qualified to the recommendations described in RG 1.43 and no underclad flaws have been found at WCGS, the staff finds that there is reasonable assurance that the WCGS reactor vessel has no underclad flaws in which the aging effect of crack growth due to cyclic loading can occur. On the basis that there are no underclad flaws, the staff finds that the aging effect of crack growth due to cyclic loading of carbon steel with stainless steel cladding for the component types of reactor vessel nozzles, reactor vessel shell, and reactor vessel shell head exposed to an environment of reactor coolant, is not applicable at WCGS. The staff finds that the applicant's use of note I is appropriate, and that the applicant's AMR results are 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 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, and Reactor Coolant System - Summary of Aging Management Evaluation - Reactor Coolant System – 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 coolant system component groups.

Nickel Alloy Closure Bolting Exposed to Borated Water Leakage (Loss of Preload). The staff noted that the applicant proposed to manage loss of preload in nickel alloys in closure bolting exposed to an external environment of borated water leakage by using the Bolting Integrity Program. The applicant applied note F for this AMR result, indicating that the material for this component is not in the GALL Report.

The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program description states that the program manages the aging effects of cracking, loss of material, and loss of preload for pressure retaining bolting and ASME components support bolting. The program includes pre-load control, selection of bolting material, use of lubricants and sealants consistent with EPRI good practices, and periodic inspections for indications of aging effects.

On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that, since the applicant will use pre-load control and periodic inspection for these components, the aging effect of loss of pre-load in nickel alloy closure bolting can be effectively managed by using the Bolting Integrity Program.

Stainless Steel Piping and Valves Exposed to Demineralized Water. The staff noted that the applicant proposed to manage loss of material in stainless steel for component types piping and valves exposed to an internal environment of demineralized water using the Water Chemistry and the One-Time Inspection Programs. The applicant applied note G for these AMR results, indicating that the material and environment combination for these components is not in the GALL Report. However, these lines appear to have the same component, material and environment combination described in GALL Report, line V.C-4. The staff requested that the applicant explain why note G was used for these lines. By letter dated August 31, 2007, the applicant amended the LRA to revise these lines to reference GALL Report item V.C-4 and note D.

The staff finds that these line items are now consistent with the GALL Report and; therefore, the applicant's response is acceptable.

CASS Piping Exposed to Reactor Coolant. The staff noted that the applicant stated that the aging effect of thermal aging embrittlement of CASS for piping exposed to an internal environment of reactor coolant is not applicable at WCGS. The applicant did not propose an AMP to manage this aging effect. The applicant applied note I for these AMR results, indicating that the aging effect in the GALL Report for this component, material, and environment combination is not applicable.

The applicant stated that the WCGS reactor coolant system loops are constructed of CASS and that the straight piping pieces are centrifugally-cast and the fittings are statically-cast. The applicant stated that the molybdenum and ferrite values for these components are below the industry accepted thermal aging embrittlement significance thresholds (i.e., less than 0.5 percent molybdenum and less than 20 percent ferrite). Therefore, thermal aging embrittlement of CASS piping in the reactor coolant system is not applicable at WCGS.

The staff noted that GALL AMP XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)," states that 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 steels (i.e., 0.5 weight percent maximum), only static-cast steels with greater than 20 percent ferrite are potentially susceptible to thermal embrittlement. Static-cast low molybdenum steels with less than or equal 20 percent ferrite and all centrifugal-cast low molybdenum steels are not susceptible.

The staff requested that the applicant provides the actual maximum molybdenum and ferrite values for the Class 1 CASS piping, piping components, and piping elements, and provide copies of applicable certified material test reports for the staff review.

In its response, the applicant stated that the actual maximum molybdenum content is 0.35 percent and the actual maximum ferrite content is 19.5 percent. The staff reviewed the applicant's certified material test reports and confirmed these values.

On the basis that the CASS piping in the reactor coolant system has molybdenum and ferrite values that are below the threshold limits, the staff finds that the aging effect of thermal aging embrittlement is not applicable for this component, material, and environment combination at WCGS and that no AMP is needed to manage this aging effect.

Nickel Alloy Closure Bolting Exposed to Borated Water Leakage (Cumulative Fatigue). The staff noted that the applicant proposed to manage the aging effect of cumulative fatigue damage in nickel alloys in closure bolting components exposed to an external environment of borated water leakage using a TLAA evaluated for the period of extended operation. The applicant applied note F for this AMR result, indicating that the material for this component is not in the GALL Report. The staff's evaluation of the applicant's TLAA is documented in SER Section 4.3.

On the basis of its review of this TLAA, the staff finds the AMR result acceptable.

The staff noted that in the AMR result for cumulative fatigue damage in the stainless steel pressurizer relief tank that is exposed to an internal environment of treated borated water, the applicant stated that no vessel, tank, pump, or heat exchanger designs at WCGS are supported by TLAAs. The applicant stated that the only exception is the ASME Class 1 components and Class 2 portions of the steam generators. The applicant applied note I for this AMR result, indicating that the aging effect in the GALL Report for this component, material, and environment combination is not applicable at WCGS. The staff's evaluation of the applicant's TLAA is documented in SER Section 4.3. On the basis that the CLB does not include a TLAA for the pressurizer relief tank, the staff finds the AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Reactor Vessel, Internals, and Reactor Coolant System - Summary of Aging Management Evaluation - Steam Generators – LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of AMR evaluations for the steam generators component groups.

The staff noted that in the AMR result for the aging effect of cumulative fatigue damage in the nickel alloy steam generator tubes exposed to an external environment of secondary water, the applicant stated that at WCGS cumulative fatigue damage of steam generator tubes is not a TLAA, as defined in 10 CFR 54.3. The applicant applied note I for this AMR result, indicating that the aging effect in the GALL Report for this component, material, and environment combination is not applicable at WCGS. The staff's evaluation of the applicant's TLAA is documented in SER Section 4.3. Based on its review and on the basis that the CLB does not necessitate a TLAA for the steam generator tubes (i.e., not needed), the staff finds the AMR result acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL

Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the reactor vessel, RVI, and reactor coolant system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2 Aging Management of Engineered Safety Features

This Section of the SER documents the staff's review of the applicant's AMR results for the engineered safety features components and component groups of:

- nuclear sampling system
- containment spray system
- containment integrated leak rate test system
- decontamination system
- liquid radwaste system
- reactor makeup water system
- containment purge HVAC system
- breathing air system
- hydrogen control system
- high pressure coolant injection system
- residual heat removal system

3.2.1 Summary of Technical Information in the Application

LRA Section 3.2 provides AMR results for the engineered safety features components and component groups. LRA Table 3.2.1, "Summary of Aging Management Evaluations in Chapter V of NUREG-1801 for Engineered Safety Features," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the engineered safety features 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 engineered safety features components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.2.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.2.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.2.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.2.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.2-1 summarizes the staff's evaluation of components, aging effects 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 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 ECCS (3.2.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes	TLAA	Consistent with GALL Report (See SER Section 3.2.2.2.1)

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 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 IN 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks"	Yes	Not applicable	Not applicable to WCGS (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	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.2.2.2.3.1)
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	Buried Piping and Tanks Inspection (B2.1.18)	Consistent with GALL Report (See SER Section 3.2.2.2.3.2)
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 3.2.2.2.3.3)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.2.1-6)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.2.2.2.3.4)

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
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 WCGS (See SER Section 3.2.2.2.3.5)
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 WCGS (See SER Section 3.2.2.2.3.6)
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	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.2.2.2.4.1)
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 WCGS (See SER Section 3.2.2.2.4.2)
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)
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 WCGS (See SER Section 3.2.2.2.6)

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 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 3.2.2.2.8.1)
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	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.2.2.2.8.2)
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	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.2.2.2.8.3)
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 micro biologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Not applicable	Not applicable to WCGS (See SER Section 3.2.2.2.9)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to SCC and IGSCC	BWR Stress Corrosion Cracking and Water Chemistry	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 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
CASS piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (> 482°F) (3.2.1-20)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	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, SCC	Bolting Integrity	No	Not applicable	Not applicable to WCGS (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 WCGS (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 (B2.1.7)	Consistent with GALL Report
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 (B2.1.7)	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water > 60°C (> 140°F) (3.2.1-25)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System (B2.1.10)	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 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	Closed-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
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-Cycle Cooling Water System (B2.1.10)	Consistent with 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-Cycle Cooling Water System (B2.1.10)	Consistent with 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	Closed-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
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-Cycle Cooling Water System (B2.1.10)	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
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 (B2.1.20)	Consistent with 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	Not applicable	Not applicable to WCGS (See SER Section 3.2.2.1.1)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report
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 micro biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (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
Steel heat exchanger components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and micro biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (See SER Section 3.2.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and micro biologically-influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (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 micro biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (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 micro biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (See SER Section 3.2.2.1.1)
Steel and stainless steel heat exchanger tubes (serviced by OCCW) 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 WCGS (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	Not applicable	Not applicable to WCGS (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, 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 WCGS (See SER Section 3.2.2.1.1)
Gray cast iron piping, piping components, and piping elements exposed to soil (3.2.1-43)	Loss of material due to selective leaching	Selective Leaching of Materials	No	Not applicable	Not applicable to WCGS (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 WCGS (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 (B2.1.4)	Consistent with GALL Report
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 WCGS (See SER Section 3.2.2.1.1)
CASS piping, piping components, and piping elements exposed to treated borated water > 250°C (> 482°F) (3.2.1-47)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	No	Not applicable	Not applicable to WCGS (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
Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water > 60°C (> 140°F) (3.2.1-48)	Cracking due to SCC	Water Chemistry	No	Water Chemistry (B2.1.2)	Consistent with GALL Report
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 (B2.1.2)	Consistent with 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 GALL Report
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	No	Not applicable	Not applicable to WCGS (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 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 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 air - indoor controlled (external) (3.2.1-54)	None	None	No	Not applicable	Not applicable to WCGS (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 GALL Report
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 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 WCGS (See SER Section 3.2.2.1.1)

The staff's review of the engineered safety features 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 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 engineered safety features 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 engineered safety features components:

- ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Water Chemistry

- Boric Acid Corrosion
- Flow-Accelerated Corrosion
- Bolting Integrity
- Closed-Cycle Cooling Water System
- One-Time Inspection
- Selective Leaching of Materials
- Buried Piping and Tanks Inspection
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping
- External Surfaces Monitoring
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis
- Nickel Alloy Aging Management

LRA Tables 3.2.2-1 through 3.2.2-11 summarize AMRs for the engineered safety features 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 the GALL Report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also 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 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 verified whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff completed its audit and review 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 3.3.1, the applicant identifies items 21, 22, 32, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 46, 47, 51, 54, and 57, as not applicable since the component, material, and environment combination does not exist at WCGS. 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 at WCGS. On the basis that WCGS does not have this combination, the staff finds that these AMRs are not applicable to WCGS.

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 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 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.2.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the engineered safety features components and provides information concerning how it will manage the following aging effects and related QA:

- cumulative fatigue damage
- loss of material due to cladding
- loss of material due to pitting and crevice corrosion
- reduction of heat transfer due to fouling

- hardening and loss of strength due to elastomer degradation
- loss of material due to erosion
- loss of material due to general corrosion and fouling
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and 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 GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.2.2.2. The staff's review of the applicant's further evaluation follows.

3.2.2.2.1 Cumulative Fatigue Damage

LRA Section 3.2.2.2.1 states that fatigue is a TLAA, as 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

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). The applicant stated that this aging effect is not applicable because WCGS does not have steel with stainless steel *cladding pump casing exposed to treated borated water in the ECCS within the scope of license* renewal. Therefore, the applicable GALL Report line item was not used.

SRP-LR Section 3.2.2.2.2 states that loss of material due to cladding breach may occur in PWR steel pump casings with stainless steel cladding exposed to treated borated water.

The staff noted that this item applies to steel pump casings with stainless steel cladding. The staff finds that this item is not applicable because WCGS does not have steel pump casings with stainless steel cladding exposed to treated borated water.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.2.2.2.2 criteria.

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 pitting and crevice corrosion on internal surfaces of stainless steel containment isolation piping and components exposed to treated water. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage this aging effect in stainless steel components exposed to demineralized water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations).

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.

The staff reviewed the Water Chemistry Program, which monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The applicant stated that it will use the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program. The One-Time Inspection Program inspects select stainless steel components exposed to treated water at susceptible locations, such as stagnant areas, for loss of material due to pitting and crevice corrosion.

The staff's evaluation of the Water Chemistry and the One-Time Inspection Program is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion on internal surfaces of stainless steel containment isolation piping and components exposed to treated water.

(2) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in stainless steel piping and components exposed to soil. The applicant stated that the Buried Piping and Tanks Inspection Program will manage this aging effect for the stainless steel external surfaces of buried piping.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff noted that in the discussion column of LRA Table 3.2.1, item 4, the applicant stated that loss of material in stainless steel piping exposed to an external environment of buried is managed by the Buried Piping and Tank Inspection Program. LRA Table 3.2.1, item 4, is referenced in LRA Table 3.2.2-10.

The staff noted that the applicant applied note E to the AMR result, indicating that the component type, material, environment, and aging effect are consistent with the GALL Report. However, where the GALL Report recommends a plant-specific program, the applicant proposed using the Buried Piping and Tank Inspection Program.

The staff reviewed the Buried Piping and Tanks Inspection Program and finds that this program will provide planned inspections for loss of material due to pitting and crevice corrosion for stainless steel components exposed to soil, within ten years from entering the period of extended operation, unless an opportunistic inspection has occurred within this 10-year period. The staff finds that the Buried Piping and Tanks Inspection Program is consistent with the recommendations of the GALL Report, and is adequate to manage loss of material due to pitting and crevice corrosion in stainless steel piping and components exposed to soil.

(3) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in BWR stainless steel and aluminum piping and components exposed to treated water. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water.

The staff noted that this item applies to BWR system components and; therefore, is not applicable because WCGS is a PWR plant. On this basis, the staff finds that this aging effect is not applicable to this component type.

(4) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in stainless steel and copper piping and components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in copper alloys, copper nickel, and stainless steel components exposed to lubricating oil, except for the RCP lube oil leakage collection system. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation to verify the effectiveness of lubricating oil programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the Lubricating Oil Analysis Program, which monitors oil chemical and physical properties, wear metals, contaminants, additives, and water, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The effectiveness of the Lubricating Oil Analysis Program is verified by the One-Time Inspection Program. The staff finds that the One-Time Inspection Program provides inspection of select stainless steel and copper alloy components exposed to lubricating oil for loss of material due to pitting and crevice corrosion. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion in stainless steel and copper piping and components exposed to lubricating oil.

(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. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel tanks with a moisture barrier configuration exposed to raw water in the ECCS; therefore, the applicable GALL Report line item was not used.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering.

The staff noted that this item is applicable to partially encased stainless steel tanks exposed to raw water. The staff agrees with the applicant's determination that this item in SRP-LR Section 3.2.2.2.3 does not apply because WCGS does not have stainless steel tanks with a moisture barrier configuration exposed to raw water in the ECCS.

(6) LRA Section 3.2.2.2.3 addresses loss of material due to pitting and crevice corrosion in stainless steel piping, components, and tanks exposed to internal condensation. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation (internal) in the containment spray and ECCSs within the scope of license renewal. Therefore, the applicable GALL Report line item was not used.

SRP-LR Section 3.2.2.2.3 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation.

The staff noted that this item is applicable to stainless steel piping, components, and tanks exposed to internal condensation. The staff agrees with the applicant's determination that this item in SRP-LR Section 3.2.2.2.3 does not apply because WCGS does not have stainless steel piping, piping components, piping elements, and tank internal surfaces exposed to condensation in the containment spray and ECCSs within the scope of license renewal.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.3 criteria. For those line items that apply to LRA Section 3.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.2.2.2.4 against the following 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 in stainless steel and copper heat exchanger tubes exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage reduction of heat transfer due to fouling for copper nickel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

    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 Lubricating Oil Analysis Program, which monitors oil chemical and physical properties, wear metals, contaminants, additives, and water, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The effectiveness of the Lubricating Oil Analysis Program is verified by the One-Time Inspection Program. The One-Time Inspection Program provides inspections of stainless steel and copper heat exchanger tubes exposed to lubricating oil for reduction of heat transfer due to fouling at susceptible locations where contaminants can accumulate. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage reduction of heat transfer due to fouling in stainless steel and copper heat exchanger tubes exposed to lubricating oil.

(2) LRA Section 3.2.2.2.4 addresses reduction of heat transfer due to fouling in stainless steel heat exchanger tubes exposed to treated water. The applicant stated that this aging effect is not applicable to WCGS because WCGS does not have stainless steel heat exchanger tubes exposed to treated water in the containment spray system that

are within the scope of license renewal. Therefore, the applicable GALL Report line item was not used.

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 staff noted that this item is applicable to stainless steel heat exchanger tubes exposed to treated water. The staff agrees that this item of SRP-LR Section 3.2.2.2.4 does not apply because WCGS does not have stainless steel heat exchanger tubes exposed to treated water in the containment spray system that are within the scope of license renewal.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.4 criteria. For those line items that apply to LRA Section 3.2.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.5 Hardening and Loss of Strength Due to Elastomer Degradation

The staff reviewed LRA Section 3.2.2.2.5 against the criteria in SRP-LR Section 3.2.2.2.5.

LRA Section 3.2.2.2.5 addresses hardening and loss of strength due to elastomer degradation. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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.

The staff noted that this item applies to BWR standby gas treatment system ductwork and filters and; therefore, is not applicable because WCGS is a PWR plant. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.2.2.2.5 criteria.

3.2.2.2.6 Loss of Material Due to Erosion

The staff reviewed LRA Section 3.2.2.2.6 against the criteria in SRP-LR Section 3.2.2.2.6.

LRA Section 3.2.2.2.6 addresses loss of material due to erosion. The applicant stated that this aging effect is not applicable because WCGS does not use the safety injection pumps for normal charging; therefore, the applicable GALL Report line item was not used.

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.

During its review, the staff requested that the applicant provides procedures and/or other documentation to show the infrequent use of the HPSI pumps. In its response, the applicant provided documentation for staff review. The staff noted that the HPSI mini-flow recirculation lines containing flow orifices are only used during ECCS injection or during HPSI pump testing, and that the HPSI pumps are only actuated during testing and are not used during normal charging. Since loss of material due to erosion can only occur in these components if they are frequently operated, the staff finds that erosion is not plausible in the HPSI pumps and flow orifices at WCGS. On this basis, the staff agrees that this item in SRP-LR Section 3.2.2.2.4 does not apply to WCGS.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.2.2.2.6 criteria.

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. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.2.2.2.7 states that loss of material due to general corrosion and fouling may occur on steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled and may cause plugging of the spray nozzles and flow orifices.

The staff noted that this item applies to BWR steel drywell and suppression chamber spray system and; therefore, is not applicable because WCGS is a PWR plant. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.2.2.2.7 criteria.

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 in BWR piping and components exposed to treated water. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

    SRP-LR Section 3.2.2.2.8 states that loss of material due to general, pitting, and crevice corrosion may occur in BWR steel piping, piping components, and piping elements exposed to treated water.

    The staff noted that this line item applies to BWR steel piping, piping components, and piping elements and; therefore, is not applicable WCGS is a PWR plant. On this basis, the staff finds that this aging effect is not applicable to this component type.

(2) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion on internal surfaces of containment isolation piping and components exposed to treated water. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage this aging effect in carbon steel components exposed to demineralized water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations).

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.

The staff reviewed the Water Chemistry Program which monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The applicant stated that it will use the One-Time Inspection Program to verify the effectiveness of the Water Chemistry Program. The One-time Inspection Program provides inspections of select steel components exposed to treated water at susceptible locations, such as stagnant areas, for loss of material due to general, pitting, and crevice corrosion. The staff's evaluation of the Water Chemistry and the One-time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion on internal surfaces of containment isolation piping and components exposed to treated water.

(3) LRA Section 3.2.2.2.8 addresses loss of material due to general, pitting, and crevice corrosion in steel piping and components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in carbon steel (including galvanized) components exposed to lubricating oil, except for the RCP lube oil leakage collection system. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

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 Lubricating Oil Analysis Program, which monitors oil chemical and physical properties, wear metals, contaminants, additives, and water, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The applicant stated that it will use the One-Time Inspection Program to verify the effectiveness of the Lubricating Oil Analysis Program. The One-Time Inspection Program provides inspections of steel piping and components exposed to lubricating oil for loss of material due to general, pitting, and crevice corrosion at susceptible locations where contaminants can accumulate. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in steel piping and components exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.2.2.2.8 criteria. For those line items that apply to LRA Section 3.2.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.9 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.2.2.2.9 against the criteria in SRP-LR Section 3.2.2.2.9.

LRA Section 3.2.2.2.9 addresses loss of material due to general, pitting, crevice, and MIC. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.2.2.2.9 states that loss of material due to general, pitting, crevice, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and operating experience to manage the aging effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified by evaluation of an applicant's inspection frequency and operating experience with buried components to ensure that loss of material does not occur.

In the LRA, the applicant stated that SRP-LR Section 3.2.2.2.9 does not apply because WCGS is a PWR plant. During the review, the staff requested that the applicant explain why it stated that buried piping is only found in BWRs.

In its response, the applicant stated that SRP-LR Section 3.2.2.2.9 is a rollup item from the standby gas treatment systems, which is a BWR-specific system, and that there is no buried carbon steel piping associated with the engineered safety features systems at WCGS. On this basis, the staff finds that at WCGS, this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.2.2.2.9 criteria.

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 through 3.2.2-11, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.2.2-1 through 3.2.2-11, 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 of the listed LRA Notes (above) is documented in the following sections.

3.2.2.3.1 Engineered Safety Features - Summary of Aging Management Evaluation - Nuclear Sampling System – LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the nuclear sampling system component groups.

In LRA Table 3.2.2-1, the applicant applied note F for stainless steel closure bolting exposed to an external environment of borated water leakage, indicating that this component material is not in the GALL Report. The staff reviewed the GALL Report and concludes that the AMR item, stainless steel closure bolting, is not evaluated for a borated water leakage environment for loss of pre-load and accordingly, the applicant's use of note F is appropriate. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity

Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this AMP is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel closure bolting exposed to an external environment of borated water leakage will be adequately managed by using 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 Engineered Safety Features - Summary of Aging Management Evaluation - *Containment Spray System – LRA Table 3.2.2-2*

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the containment spray system component groups.

In LRA Table 3.2.2-2, the applicant applied note G for stainless steel piping, valves, and tanks exposed to a sodium hydroxide environment, indicating that the environment for this component and material is not in the GALL Report. On the basis of its review, the staff finds that the applicant's use of note G is appropriate for this component, material, and environment combination. The applicant credited the Water Chemistry and the One-Time Inspection Programs to manage loss of material due to pitting and crevice corrosion.

The staff finds that the Water Chemistry Program ensures the sodium hydroxide levels are maintained to a normal value of 29.8 weight percentage in accordance with plant procedures. The staff noted that all stainless steels are resistant to general corrosion at all sodium hydroxide levels up to 150 °F. Therefore, adherence to this limit will minimize the potential for pitting and crevice corrosion provided that the temperature does not exceed 150 °F.

The applicant stated that the One-Time Inspection Program will verify that loss of material or cracking will not be a problem during the period of extended operation provided that operating temperature is below 150 °F and 212 °F, respectively.

The staff noted that above these temperatures, loss of material and cracking can be expected, and it appears that a one-time inspection would not be sufficient to manage these aging effects through the period of extended operation.

During the audit, the staff requested that the applicant provides the temperature range of operation for these components.

In its response, the applicant stated that the piping design and nominal operating temperatures are 125 °F and 100 °F, respectively, and the tank operating temperature is 120 °F. On the basis that operating temperatures are below 150 °F, the staff finds that cracking is not plausible and loss of material due to pitting and crevice corrosion is not likely. The staff's evaluation of the Water Chemistry and the One-time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. On this basis, the staff finds that the Water

Chemistry and the One-Time Inspection Programs are adequate to manage loss of material due to pitting and crevice corrosion for containment spray system stainless steel piping, valves, and tanks exposed to sodium hydroxide environment during the period of extended operation.

The staff noted that the applicant applied note F for stainless steel closure bolting exposed to an external environment of borated water leakage, indicating that the component material is not in the GALL Report. The staff reviewed the GALL Report and concludes that the AMR item for stainless steel closure bolting is not evaluated in a borated water leakage environment for loss of pre-load. The staff finds that the applicant's use of note F is appropriate.

The applicant credited the Bolting Integrity Program for managing loss of preload. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel closure bolting exposed to an external environment of borated water leakage will be adequately managed by using 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).

3.2.2.3.3 Engineered Safety Features - Summary of Aging Management Evaluation - Containment Integrated Leak Rate Test System – LRA Table 3.2.2-3

The staff reviewed LRA Table 3.2.2-3, which summarizes the results of AMR evaluations for the containment integrated leak rate test system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.2.2-3 are consistent with the GALL Report.

The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.4 Engineered Safety Features - Summary of Aging Management Evaluation - Decontamination System – LRA Table 3.2.2-4

The staff reviewed LRA Table 3.2.2-4, which summarizes the results of AMR evaluations for the decontamination system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.2.2-4 are consistent with the GALL Report.

The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.5 Engineered Safety Features - Summary of Aging Management Evaluation - Liquid Radwaste System – LRA Table 3.2.2-5

The staff reviewed LRA Table 3.2.2-5, which summarizes the results of AMR evaluations for the liquid radwaste system component groups.

In LRA Table 3.2.2-5, the applicant applied note F for stainless steel closure bolting exposed to an external environment of borated water leakage, indicating that the component material is not in the GALL Report. The staff reviewed the GALL Report and concludes that the AMR item for stainless steel closure bolting is not evaluated for a borated water leakage environment for loss of preload. The staff finds that the applicant's use of note F is appropriate.

The applicant credited the Bolting Integrity Program for managing loss of pre-load. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel closure bolting exposed to an external environment of borated water leakage will be adequately managed by using 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).

3.2.2.3.6 Engineered Safety Features - Summary of Aging Management Evaluation - Reactor Makeup Water System – LRA Table 3.2.2-6

The staff reviewed LRA Table 3.2.2-6, which summarizes the results of AMR evaluations for the reactor makeup water system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.2.2-6 are consistent with the GALL Report.

The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.7 Engineered Safety Features - Summary of Aging Management Evaluation - Containment Purge HVAC System – LRA Table 3.2.2-7

The staff reviewed LRA Table 3.2.2-7, which summarizes the results of AMR evaluations for the containment purge HVAC system component groups.

In LRA Table 3.2.2-7, the applicant applied note H for steel closure bolting exposed to an external environment of atmosphere weather indicating that the aging effect for this component, material, and environment combination is not evaluated in the GALL Report. The staff reviewed the GALL Report and concludes that the AMR item for steel closure bolting is not evaluated in an external environment of atmosphere weather for loss of preload. The staff finds that the applicant's use of note H is appropriate.

The applicant credited the Bolting Integrity Program for managing loss of preload. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in steel closure bolting exposed to an external environment of atmosphere weather will be adequately managed by using 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).

3.2.2.3.8 Engineered Safety Features - Summary of Aging Management Evaluation - Breathing Air System – LRA Table 3.2.2-8

The staff reviewed LRA Table 3.2.2-8, which summarizes the results of AMR evaluations for the breathing air system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.2.2-8 are consistent with 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).

3.2.2.3.9 Engineered Safety Features - Summary of Aging Management Evaluation - Hydrogen Control System – LRA Table 3.2.2-9

The staff reviewed LRA Table 3.2.2-9, which summarizes the results of AMR evaluations for the hydrogen control system component groups.

In LRA Table 3.2.2-9, the applicant applied note G for carbon steel piping and valves, indicating that the internal environment of ventilation atmosphere for this component material is not in the GALL Report. The staff finds that the applicant's use of note G for this component, material, and environment combination is appropriate.

The applicant credited the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program for management of loss of material due to general, pitting, and crevice corrosion. In its review of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program, the staff noted that visual inspections of internal surfaces of plant components will be performed during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance activities. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in carbon steel piping and valves exposed to an internal environment of ventilation atmosphere will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components 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).

3.2.2.3.10 Engineered Safety Features - Summary of Aging Management Evaluation - High Pressure Coolant Injection System – LRA Table 3.2.2-10

The staff reviewed LRA Table 3.2.2-10, which summarizes the results of AMR evaluations for the high pressure coolant injection system component groups.

In LRA Table 3.2.2-10, as amended by letter dated August 31, 2007, the applicant applied note G for stainless steel piping and tanks and heat exchanger tube side, indicating that the external environment of ventilation atmosphere weather for these components material is not in the GALL Report. The staff finds that the applicant's use of note G is appropriate for this component, material, and environment combination.

The applicant did not credit an AMP because there are no aging effects in stainless steel exposed to weather. The staff noted that there are no plausible aging effects for stainless steel exposed to weather. Therefore, the staff agrees that no AMP is necessary for this component, material, and environment combination.

In LRA Table 3.2.2-10, the applicant applied note F for the nickel alloy accumulator. The GALL Report, Section V.D1, does not include any nickel alloy components. The staff finds that the applicant's use of note F is appropriate for this component, material, and environment combination.

The applicant credited the Water Chemistry Program for managing loss of material caused by pitting and crevice corrosion. The staff noted that crediting only the Water Chemistry Program will provide effective management of loss of material in nickel alloys exposed to treated borated water where there is no stagnant flow. However, control of water chemistry alone does not preclude loss of material under low flow conditions. The staff noted that accumulators typically have low flow and additional actions may be necessary to verify that long term corrosion is not occurring. The staff requested that the applicant clarify if additional provisions will be taken to ensure that corrosion is not progressing slowly.

By letter dated August 31, 2007, the applicant amended LRA Table 3.2.2-10 to include the One-Time Inspection Program for managing the loss of material due to pitting and crevice corrosion. The staff noted that a one-time inspection is an acceptable method to determine whether or not loss of material is occurring slowly such that the component's intended function will be maintained during the period of extended operation. On this basis, the staff finds that the Water Chemistry and the One-Time Inspection Programs are adequate to manage loss of material due to pitting and crevice corrosion in nickel alloy accumulators during the period of extended operation.

In LRA Table 3.2.2-10, the applicant applied note F for stainless steel closure bolting exposed to an external environment of borated water leakage, indicating that the component material is not in the GALL Report. The staff reviewed the GALL Report and concludes that the AMR line item for stainless steel closure bolting is not evaluated in a borated water leakage environment for loss of pre-load. The staff finds that the applicant's use of note F is appropriate.

The applicant credited the Bolting Integrity Program for managing loss of pre-load. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel closure bolting exposed to an external environment of borated water leakage will be adequately managed by using the Bolting Integrity Program.

The staff noted that the applicant credited the Nickel Alloy AMP to manage PWSCC in nickel alloy components in the accumulator. The applicant credited note 2 for these AMR line items indicating that the accumulator nozzles in the HPCI system contain nickel alloy 82/182 weld metal. The staff noted that Alloy 82/182 is known to be susceptible to SCC, such as PWSCC and IGSCC, depending on environment. The susceptibility to SCC requires the presence of three conditions, namely, the susceptible material, the aggressive environment and the tensile stresses. If any of these three conditions is absent, the degradation due to SCC will not occur.

The staff determines that the subject nickel alloy components in the HPCI accumulator will not be susceptible to PWSCC because the subject components are not exposed to the reactor coolant. As stated in LRA Table 3.1.2.3, the subject components are exposed to treated borated water; therefore, these components may be subject to IGSCC.

As discussed in SER Section 3.0.3.3.1, in its response to RAI B.2.1.34-6 dated July 26, 2007, the applicant stated, in note 2 to the table, that the system and piping temperature at the accumulator nozzle locations is ambient containment temperature (i.e., approximately 100 °F). Therefore, the staff finds that even if the subject components are susceptible to IGSCC, its degree of susceptibility should be very low because it would take a long time for the cracks to be initiated at such a low temperature. The staff finds that in the Nickel Alloy Aging Management Program, the subject components will be visually inspected (i.e., VT-2) every ISI period.

On the basis of its review, the staff determines that the proposed examination in the Nickel Alloy Aging Management Program is adequate to monitor the potential degradation due to PWSCC or IGSCC.

The staff finds that the applicant's Nickel Alloy AMP commitment (Commitment No. 30) will implement: (1) NRC Orders, Bulletins and GLs associated with nickel alloys, (2) staff-accepted industry guidelines, and (3) participation in industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys. The staff finds that the applicant will submit the Nickel Alloy Aging Management Program inspection plan to the NRC, for review and approval, 24 months before entering the period of extended operation.

The staff finds that this commitment provides reasonable assurance that an acceptable Nickel Alloy AMP will be implemented and that the aging effects will be adequately managed 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).

3.2.2.3.11 Engineered Safety Features - Summary of Aging Management Evaluation - Residual Heat Removal System – LRA Table 3.2.2-11

The staff reviewed LRA Table 3.2.2-11, which summarizes the results of AMR evaluations for the residual heat removal system component groups.

In LRA Table 3.2.2-11, the applicant applied note G for stainless steel heat exchanger materials indicating that an internal environment of treated borated water for this component material is not in the GALL Report. The staff finds that the applicant's use of note G is appropriate for this component, material, and environment combination.

The applicant credited the Water Chemistry and One-Time Inspection Programs for management of reduction of heat transfer. The staff noted that water chemistry control provides effective management of loss of material in stainless steel exposed to treated borated water, while a one-time inspection will verify that loss of material due to pitting and crevice corrosion is not progressing slowly. On this basis, the staff finds that loss of material due to pitting and crevice corrosion in stainless steel heat exchanger materials will be adequately managed during the period of extended operation.

The staff noted that the applicant applied note F for stainless steel closure bolting exposed to an external environment of borated water leakage, indicating that the component material is not in the GALL Report. The staff reviewed the GALL Report and concludes that the AMR line item for stainless steel closure bolting is not evaluated in a borated water leakage environment for loss of preload. The staff finds that the applicant's use of note F is appropriate.

The applicant credited the Bolting Integrity Program for managing loss of pre-load. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience (reflecting the adequacy of the program and is consistent with the recommendations of the GALL Report), the staff finds that the aging effect of loss of pre-load of stainless steel closure bolting exposed to an external environment of borated water leakage will be adequately managed by using 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).

3.2.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the engineered safety features 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 handling - fuel storage and handling system
- fuel pool cooling and cleanup system
- essential service water system
- component cooling water system
- containment cooling system
- compressed air system
- chemical and volume control system
- auxiliary building HVAC system
- control building HVAC system
- fuel building HVAC system
- essential service water pumphouse building HVAC system
- miscellaneous buildings HVAC system
- diesel generator building HVAC system
- fire protection system
- emergency diesel engine fuel oil storage and transfer system
- emergency diesel engine system
- floor and equipment drains system
- oily waste system
- cranes, hoists and elevator systems
- turbine building HVAC system
- miscellaneous auxiliary systems in-scope only based on criterion 10 CFR 54.4(a)(2)

3.3.1 Summary of Technical Information in the Application

LRA Section 3.3 provides AMR results for the auxiliary systems components and component groups. LRA Table 3.3.1, "Summary of Aging Management Evaluations in Chapter VII of NUREG-1801 for Auxiliary Systems," 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 initially.

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 onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.3.2.1.

In the onsite audit, the staff also selected AMRs 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 that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.3.2.3.

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 Systems 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	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	Not applicable	Not applicable to WCGS (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 SCC	Water Chemistry and One-Time Inspection	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.3.1)
Stainless steel and stainless clad steel heat exchanger components exposed to treated water > 60°C (> 140°F) (3.3.1-5)	Cracking due to SCC	A plant-specific aging management program is to be evaluated.	Yes	Not applicable	Not applicable to PWRs (See SER Section 3.3.2.2.3.2)

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 diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-6)	Cracking due to SCC	A plant-specific aging management program is to be evaluated.	Yes	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.3.3)
Stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-7)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.2.4.1)
Stainless steel regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-8)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated.	Yes	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2.4.2)

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 high-pressure pump casing in PWR CVCS (3.3.1-9)	Cracking due to SCC and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated.	Yes	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2.4.3)
High-strength steel closure bolting exposed to air with steam or water leakage. (3.3.1-10)	Cracking due to SCC, cyclic loading	Bolting Integrity. The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Yes	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.2.4.4)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22), External Surfaces Monitoring (B2.1.20) and Fire Protection (B2.1.12)	Consistent with GALL Report (See SER Section 3.3.2.2.5.1)
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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.2.5.2)
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	None	Consistent with GALL Report (See SER Section 3.3.2.2.6)

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 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	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2.7.1)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.7.1)
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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.2.7.1)
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 3.3.2.2.7.2)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.7.3)
Steel (with or without coating or wrapping) piping, piping components, and piping elements exposed to soil (3.3.1-19)	Loss of material due to general, pitting, crevice, and MIC	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Buried Piping and Tanks Inspection (B2.1.18)	Consistent with GALL Report (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 MIC, and fouling	Fuel Oil Chemistry and One-Time Inspection	Yes	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2.9.1)

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 (3.3.1-21)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2. 9.2)
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 WCGS (See SER Section 3.3.2.2. 10.1)
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. 10.2)
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. 10.2)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22) and External Surfaces Monitoring (B2.1.20)	Consistent with GALL Report (See SER Section 3.3.2.2. 10.3)
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	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2. 10.4)

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 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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.10.5)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.10.6)
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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.2.10.7)
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 3.3.2.2.10.8)
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 MIC	Fuel Oil Chemistry and One-Time Inspection	Yes	Fuel Oil Chemistry (B2.1.14) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.3.2.2.12.1)

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 piping, piping components, and piping elements exposed to lubricating oil (3.3.1-33)	Loss of material due to pitting, crevice, and MIC	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16) Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.2.12.2)
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 to WCGS (See SER Section 3.3.2.2.13)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.3.1-35)	Loss of material due to cladding breach	A plant-specific 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 to WCGS (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 SCC, IGSCC	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 SCC	BWR Stress Corrosion Cracking 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
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to SCC	Water Chemistry	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 applicable	Not applicable to WCGS (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, SCC	Bolting Integrity	No	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.1.1)
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 to WCGS (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 (B2.1.7)	Consistent with GALL Report
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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.1.1)
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 (B2.1.7)	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
Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water > 60°C (> 140°F) (3.3.1-46)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Closed-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
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-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
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-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water (3.3.1-49)	Loss of material due to MIC	Closed-Cycle Cooling Water System	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-Cycle Cooling Water System (B2.1.10)	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
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-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
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	Closed-Cycle Cooling Water System (B2.1.10)	Consistent with GALL Report
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	Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components (B2.1.22), or 10 CFR Part 50, Appendix J (B2.1.30)	Consistent with GALL Report (See SER Section 3.3.2.1.3)
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 to WCGS (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	External Surfaces Monitoring (B2.1.20)	Consistent with GALL Report
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 (B2.1.20)	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 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 (B2.1.20)	Consistent with GALL Report
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 (B2.1.20) and Inspection of Overhead Heavy and Light Load (Related to Refueling) Handling Systems (B2.1.11)	Consistent with GALL Report
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 (B2.1.20)	Consistent with GALL Report
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	External Surfaces Monitoring (B2.1.20)	Consistent with GALL Report
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 (B2.1.12)	Consistent with GALL Report
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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.1.1)
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 (B2.1.12)	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 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 (B2.1.12) and Fuel Oil Chemistry (B2.1.14)	Consistent with GALL Report
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 (B2.1.12) and Structures Monitoring Program (B2.1.32)	Consistent with GALL Report
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 (B2.1.12) and Structures Monitoring Program (B2.1.32)	Consistent with GALL Report
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 (B2.1.12) and Structures Monitoring Program (B2.1.32)	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and MIC, and fouling	Fire Water System	No	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.1.4)
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 Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.1.4)

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
Copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-70)	Loss of material due to pitting, crevice, and MIC, and fouling	Fire Water System	No	Fire Water System (B2.1.13) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.1.4)
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report
Steel HVAC ducting and components internal surfaces exposed to condensation (internal) (3.3.1-72)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) MIC	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report
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	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	Consistent with GALL Report
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	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (B2.1.11)	Consistent with GALL Report
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 to WCGS (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 MIC, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System (B2.1.9) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.1.5)
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System (B2.1.9)	Consistent with GALL Report
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	Open-Cycle Cooling Water System (B2.1.9)	Consistent with GALL Report
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	Open-Cycle Cooling Water System (B2.1.9) and Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.1.6)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-80)	Loss of material due to pitting, crevice, and MIC	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System (B2.1.9)	Consistent with GALL Report
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and MIC, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (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 MIC, and fouling	Open-Cycle Cooling Water System	No	Open-Cycle Cooling Water System (B2.1.9)	Consistent with GALL Report
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	Open-Cycle Cooling Water System (B2.1.9)	Consistent with GALL Report
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	Selective Leaching of Materials (B2.1.17)	Consistent with GALL Report
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	Selective Leaching of Materials (B2.1.17)	Consistent with GALL Report
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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water (3.3.1-87)	Reduction of neutron-absorbin g capacity due to boraflex degradation	Boraflex Monitoring	No	Not applicable	Not applicable to WCGS (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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.1.1)
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	Not applicable	Not applicable to WCGS (See SER Section 3.3.2.1.1)
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 SCC	Water Chemistry	No	Water Chemistry (B2.1.2)	Consistent with GALL Report
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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report (See SER Section 3.3.2.1.7)
Galvanized steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (3.3.1-92)	None (N/A)	None (N/A)	No (N/A)	None (N/A)	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
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 GALL Report
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 GALL Report
Steel and aluminum piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.3.1-95)	None	None	No	None	Consistent with GALL Report
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	No	None	Consistent with GALL Report
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.3.1-97)	None	None	No	None	Consistent with GALL Report
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 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 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 GALL Report

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:

- ASME Code Section XI Inservice Inspection, Subsections IWB, IWC, and IWD
- Water Chemistry
- Bolting Integrity
- Open-Cycle Cooling Water System
- Closed-Cycle Cooling Water System
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Fire Protection
- Fire Water System
- Fuel Oil Chemistry
- One-Time Inspection
- Selective Leaching of Materials
- Buried Piping and Tanks Inspection
- One-Time Inspection of ASME Code Class 1 Small-Bore Piping

- External Surfaces Monitoring
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis
- 10 CFR 50, Appendix J
- Structures Monitoring

LRA Tables 3.3.2-1 through 3.3.2-21 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 the GALL Report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also 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 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 verified whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

3.3.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.3.1, the staff identified items 40, 41, 42, 44, 54, 62, 75, 81, 87, 88, and 89 as not applicable because the component, material, and environment combination does not exist at WCGS. 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 WCGS. On the basis that WCGS does not have these combinations, the staff finds that these AMRs are not applicable.

3.3.2.1.2 Cracking Due to Stress Corrosion Cracking

In LRA Table 3.3.1, item 46, the applicant states that cracking of stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water with a temperature greater than 140 °F is managed by the Closed-Cycle Cooling Water System Program.

During the audit, the staff determined that the inspection aspect of the program is implemented using a plant procedure. However, it was not clear how the use of this procedure would manage cracking. The staff requested that the applicant clarify how this procedure would detect cracking.

In its response, the applicant stated that the procedure will be enhanced to define cracking, provide additional guidance for detection of cracking, and include specific acceptance criteria relating to "as-found" cracking.

By letter dated May 25, 2007, the applicant amended the LRA to include a commitment (Commitment No. 32) to enhance its plant procedure.

On the basis that the applicant committed to define cracking and provided guidance for acceptance criteria in implementing the procedure, the staff finds the response acceptable.

3.3.2.1.3 Loss of Material due to General and Pitting Corrosion

In LRA Table 3.3.1, item 53, the applicant states that loss of material in steel piping, piping components, and piping elements exposed to an internal environment of condensation is managed by the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program, or the 10 CFR Part 50, Appendix J Program, as appropriate.

During the audit, the staff noted that for the AMR results line that references LRA Table 3.3.1, item 53, the applicant applied note E.

The staff reviewed LRA Table 3.3.2-6 for the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. The staff noted that where the GALL Report recommends AMP XI.M24, "Compressed Air Monitoring Program," the applicant proposed using the 10 CFR Part 50, Appendix J Program for compressed air piping penetrating the containment and the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program for other compressed air piping.

The AMP recommended by the GALL Report states that testing of air quality is performed as part of preventive actions to mitigate degradation by keeping contaminants within specified limits. The staff requested that the applicant clarify if the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program will perform air quality checks.

In its response, the applicant stated that the wetted gas environment listed in LRA Table 3.3.2-6 for the compressed air system applies to two sections of piping and components. The first section has an internal environment of dry nitrogen vent piping that discharges to atmosphere. A wetted gas environment was conservatively chosen since there could be moisture introduced from the outside. Periodic internal visual inspection of the piping and components provides a positive means for detection of aging effects.

The staff reviewed the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program, which includes in its scope the compressed air system piping and components, and determines that it performs periodic visual inspection of internal surfaces for age related degradation during surveillance activities. On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program acceptable.

In its response, the applicant also stated that the second section is a portion of service air piping that is safety-related for containment isolation, and the attached piping is nonsafety-related for structural integrity purposes. The applicant credited the 10 CFR Part 50, Appendix J Program for this piping.

The staff noted that the 10 CFR Part 50, Appendix J Program performs seat leakage testing of containment isolation valves and visual inspection of external surfaces to ensure no leakage through containment. The staff requested that the applicant explain how loss of material on the inside surface of piping and valves will be detected by the 10 CFR Part 50, Appendix J Program.

By letter dated August 31, 2007, the applicant amended the LRA to add the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program to manage loss of material in the service air containment penetration piping internal surfaces. The applicant amended LRA Table 3.1.1, item 53, to state that the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components and/or the 10 CFR Part 50, Appendix J

Program is credited, as appropriate, to manage aging effects for the piping and components that are within the scope of license renewal.

On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the Internal Surfaces In Miscellaneous Piping and Ducting Components Program, in addition to the 10 CFR Part 50, Appendix J Program, acceptable.

On the basis of its review of AMR result lines and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

3.3.2.1.4 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, and Fouling; Loss of Material due to Pitting and Crevice Corrosion, and Fouling; and Loss of Material due to Pitting, Crevice, and Micro Biologically Influenced Corrosion, and Fouling

In LRA Table 3.3.1, items 68, 69, and 70, the applicant states that loss of material of steel and copper alloy piping, piping components, and piping elements exposed to raw water environment is managed by the Fire Water System Program in conjunction with the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program.

During the audit, the staff noted that the applicant applied note E to these items.

LRA Table 3.3.1, items 68, 69, and 70, are referenced in LRA Table 3.3.2-14. The staff reviewed the AMR results lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M27, "Fire Water System," the applicant proposed using the Fire Water System and the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Programs. The staff requested that the applicant explain how these two programs will work with each other.

In its response, the applicant stated that the Fire Water System Program is used to conduct an air or water flow test through spray or sprinkle nozzle to verify that there is no fouling, and for testing a representative sample of sprinkler heads. However, the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program is used for visual inspections to evaluate for wall thickness as recommended by the GALL Report.

The staff reviewed the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program and determines that this program detects wall thinning by identifying corrosion, surface or finish discontinuities, or a lack of symmetry of the component dimensions. If degradation is unacceptable, deficiencies would be resolved in the plant's corrective action program.

On the basis that periodic visual inspections are performed to evaluate wall thickness as recommended by the GALL Report, the staff finds that the use of the Fire Water System and the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Programs is acceptable to manage these aging effects.

On the basis of its review of AMR result lines and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

3.3.2.1.5 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, Fouling, and Lining/Coating Degradation

In LRA Table 3.3.1, item 76, the applicant states that loss of material of steel components exposed to a raw water environment in the secondary liquid waste and oily waste systems is managed by the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program.

During the audit, the staff noted that the applicant applied note E to the AMR result line that reference item 76.

LRA Table 3.3.1, item 76, is referenced in LRA Tables 3.3.2-18 and 3.3.2-21. The staff reviewed the AMR result lines referring note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M20, "Open-Cycle Cooling Water System," the applicant proposed the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program. The staff noted that the GALL Report recommends AMP XI.M20; however, the staff noted that the environment for these components is potentially contaminated raw water that is not within the scope of the Open-Cycle Cooling Water System Program. The Internal Surfaces In Miscellaneous Piping and Ducting Components Program uses periodic visual inspections to inspect representative samples of nonsafety-related components affecting safety-related systems, including the AMR result lines referencing item 76. On the basis that periodic visual inspections will be performed, the staff finds that the applicant's use of the Internal Surfaces In Miscellaneous Piping and Ducting Components Program is acceptable.

Based on its review of AMR result lines and recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

3.3.2.1.6 Loss of Material due to Pitting and Crevice Corrosion and Fouling

In LRA Table 3.3.1, item 79, the applicant states that loss of material of stainless steel components exposed to a raw environment in the secondary liquid waste, yard drainage, chemical and detergent waste, and oily waste systems is managed by the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program.

During the audit, the staff noted that the applicant applied note E to the AMR result line that reference item 79.

LRA Table 3.3.1, item 79, is referenced in LRA Tables 3.3.2-18 and 3.3.2-21. The staff reviewed the AMR result lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M20, "Open-Cycle Cooling Water System," the applicant proposed the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program. The GALL Report recommends AMP XI.M20; however, the staff noted that the environment for these components is potentially contaminated raw water that is not within the scope of the Open-Cycle Cooling Water System Program. The Internal Surfaces In Miscellaneous Piping and Ducting Components Program uses periodic visual inspections to inspect representative samples of nonsafety-related components affecting safety-related systems, including the AMR result lines referencing item 79. On the basis that periodic visual inspections will be performed, the staff finds that the applicant's use of the Internal Surfaces In Miscellaneous Piping and Ducting Components Program is acceptable.

On the basis of its review of AMR result lines and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

3.3.2.1.7 Loss of Material due to Pitting and Crevice Corrosion

In LRA Table 3.3.1, item 91, the applicant states that loss of material of stainless steel and steel with stainless steel cladding components exposed to a treated borated water environment in the floor and equipment drains system is managed by the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program.

During the audit, the staff noted that the applicant applied note E to the AMR result line that reference item 91.

LRA Table 3.3.1, item 91, is referenced in LRA Table 3.3.2-17. The staff reviewed the AMR result lines that reference note E and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.M2, "Water Chemistry," the applicant proposed the Inspections of Internal Surfaces In Miscellaneous Piping and Ducting Components Program. The GALL Report recommends AMP XI.M2; however, the staff noted that the environment for these components is potentially contaminated raw water that is not within the scope of the Water Chemistry Program. The Internal Surfaces In Miscellaneous Piping and Ducting Components Program, visually inspects representative samples of safety-related systems on a periodic basis, including the AMR result lines that reference item 91. On the basis that periodic visual inspections will be performed, the staff finds the applicant's use of the Internal Surfaces In Miscellaneous Piping and Ducting Components Program acceptable.

On the basis of its review of the AMR result lines and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

3.3.2.1.8 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion; Loss of Material due to Pitting and Crevice Corrosion; and Reduction of Heat Transfer due to Fouling

In LRA Table 3.3.2-2, the applicant credited the Closed-Cycle Cooling Water System Program to manage loss of material and reduction of heat transfer in steel piping and valves, and stainless steel thermowells and heat exchangers. The staff reviewed the Closed-Cycle Cooling Water System Program basis documents to determine if the fuel pool cooling and cleanup system (FPCCS) was included within the scope of this program. The staff determined that the

FPCCS was not included within the scope of the Closed-Cycle Cooling Water System Program. The staff requested that the applicant justify why the system was not included.

In its response, the applicant added the FPCCS to the Closed-Cycle Cooling Water System Program by using a project change tracking form. The staff reviewed this form and finds the response acceptable.

In LRA Table 3.3.2-7, the applicant credited the Closed-Cycle Cooling Water System Program to manage loss of material and reduction of heat transfer aging effects in steel heat exchanger, piping pump, tank, and valves, and stainless steel flow elements, heat exchanger, instrument bellows, piping, thermowells tubing, and valves. The staff reviewed the Closed-Cycle Cooling Water System Program basis documents to determine if the CVCS was included within the scope of this program. The staff determined that the CVCS was not included in the Closed-Cycle Cooling Water System Program. The staff requested that the applicant justify why the system was not included.

In its response, the applicant added the CVCS within the scope of the Closed-Cycle Cooling Water System Program by using a project change tracking form. The staff reviewed this form and finds the response acceptable.

On the basis of its review of the AMR result lines and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.3.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the auxiliary systems components and provides information concerning how it will manage the following aging effects and related QA:

- 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 MIC

- loss of material due to general, pitting, crevice, MIC 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 MIC
- 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 GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues that were further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.3.2.2. The staff's review of the applicant's further evaluation follows.

3.3.2.2.1 Cumulative Fatigue Damage

LRA Section 3.3.2.2.1 states that fatigue is a TLAA, as 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.

3.3.2.2.2 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.3.2.2.2 against the criteria in SRP-LR Section 3.3.2.2.2.

LRA Section 3.3.2.2.2 addresses reduction of heat transfer due to fouling. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.3.2.2.2 states that reduction of heat transfer due to fouling may occur in stainless steel heat exchanger tubes exposed to treated water. The existing program controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may be inadequate; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that this line item is applicable to BWR spent fuel pool heat exchangers and; therefore, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.2 criteria.

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 and components of BWR standby liquid control system exposed to sodium pentaborate. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in the stainless steel piping, piping components, and piping elements of the BWR 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, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

(2) LRA Section 3.3.2.2.3 addresses cracking due to SCC in stainless steel heat exchanger components exposed to treated water. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.3.2.2.3 states that cracking due to SCC may occur in stainless steel and stainless clad steel heat exchanger components exposed to treated water greater than 60 °C (140 °F). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff noted that this line item applies to BWR reactor water cleanup system heat exchangers and; therefore, is not applicable. WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

(3) LRA Section 3.3.2.2.3 addresses cracking due to SCC in stainless steel diesel engine exhaust piping and components exposed to diesel exhaust. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage cracking due to SCC in stainless steel internal surfaces exposed to diesel exhaust.

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 Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and determines that the aging effect of cracking will be adequately managed by using visual techniques to inspect representative samples of diesel exhaust components. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and that these activities are adequate to manage cracking in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust.

Based on the program identified above, the staff concludes that the applicant's program meet SRP-LR Section 3.3.2.2.3 criteria. For those line items that apply to LRA Section 3.3.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.4 Cracking Due to Stress Corrosion Cracking and Cyclic Loading

The staff reviewed LRA Section 3.3.2.2.4 against the following criteria in SRP-LR Section 3.3.2.2.4:

(1) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel PWR non-regenerative heat exchanger components exposed to borated water. The applicant stated that this aging effect is not applicable and other available GALL Report line items were used.

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 CVCS. 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 GALL Report line item applicable to this section is item VII.E1-9. The staff requested that the applicant identify what other available GALL Report line items were used.

In its response, the applicant stated that the GALL Report item VII.E1-5 was used and was evaluated as equivalent. However, item VII.E1-5 is for regenerative heat exchangers, not for non-regenerative heat exchangers as stated in this SRP-LR section.

The staff noted that the GALL Report recommends a different AMP verification for item VII.E1-9 than for item VII.E1-5 and; therefore, cannot be considered equivalent. The staff requested that the applicant justify how it considers the two line items to be equivalent.

By letter dated August 31, 2007, the applicant amended this item in the LRA to state:

Not applicable. The letdown, excess letdown, and seal water heat exchangers are exposed to treated borated water greater than 140 F (tube-side) and component cooling water shell side. The shell side is managed by the Closed-Cycle Cooling Water System Program using item number 3.3.1-46. The tube-side is managed by Water Chemistry and One-Time Inspection Programs using item number 3.3.1-08. The Closed-Cycle Cooling Water System Program (B2.2.10) includes eddy current testing for heat exchanger testing for shell side components exposed to component cooling water. Radiation monitors are installed in each train of the component cooling water system and alarm when abnormal radioactivity levels are detected. Heat exchanger outlet temperatures are not typically monitored; this was noted as a program exception to the Closed-Cycle Cooling Water System Program.

On the basis that the applicant is verifying the effectiveness of water chemistry by means of eddy current testing and monitoring of radioactivity under a separate LRA Table 3.3.1 line item, the staff finds the applicant's response acceptable. The staff confirms that this line item is not applicable to WCGS. The staff's evaluation of the Closed-Cycle Cooling Water System Program is documented in SER Section 3.0.3.2.9.

(2) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel PWR regenerative heat exchanger components exposed to borated water. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage cracking due to SCC and cyclic loading for stainless steel heat exchangers exposed to treated borated water. The one-time inspection will include selected components at susceptible locations.

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.

In LRA Table 3.3.1, item 8, the applicant does not credit the AMP recommended in the GALL Report. The GALL Report recommends the Water Chemistry Program and a plant-specific verification program. In LRA Table 3.3.1, item 8, the applicant only credits a plant-specific program. The staff requested that the applicant clarify this discrepancy/deviation.

By letter dated August 31, 2007, the applicant amended LRA Table 3.3.1, item 8, to state:

Water Chemistry (B2.1.2) and 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.

The staff reviewed the Water Chemistry Program, which monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The applicant stated that the One-Time Inspection Program will verify the effectiveness of the Water Chemistry Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Water Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage cracking due to SCC and cyclic loading in stainless steel PWR regenerative heat exchanger components exposed to treated borated water with a temperature greater than 140 °F.

(3) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in stainless steel pump casings in the CVCS. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage cracking due to SCC and cyclic loading for stainless steel pump casings exposed to treated borated water. The one-time inspection will include selected components at susceptible locations.

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 CVCS. 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.

In LRA Table 3.3.1, item 9, the applicant does not credit the AMP recommended in the GALL Report. The GALL Report recommends the Water Chemistry Program and a plant-specific verification program. In LRA Table 3.3.1, item 9, the applicant only credits a plant-specific program. The staff requested that the applicant clarify this discrepancy.

By letter dated August 31, 2007, the applicant amended LRA Table 3.3.1, item 9, to state:

> Water Chemistry (B2.1.2) and 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.

The staff reviewed the Water Chemistry Program, which monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The applicant stated that the One-Time Inspection Program will verify the effectiveness of the Water Chemistry Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Water Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage cracking due to SCC and cyclic loading in stainless steel pump casing for the PWR high-pressure pumps in the CVCS.

(4) LRA Section 3.3.2.2.4 addresses cracking due to SCC and cyclic loading in high strength bolting exposed to steam or water leakage. The applicant stated that this aging effect is not applicable because WCGS does not have high-strength steel closure bolting exposed to air with steam or water leakage in the CVCS within the scope of license renewal. Therefore, the applicable GALL Report line item was not used.

The staff noted that this item is applicable to high-strength steel closure bolting. On the basis that WCGS does not have high-strength steel closure bolting exposed to air with steam or water leakage in the CVCS within the scope of license renewal, the staff finds that the use of this item is not applicable.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.5 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 in elastomer seals of HVAC systems exposed to plant indoor air (uncontrolled). The applicant stated that the External Surfaces Monitoring Program will manage this aging effect in elastomer external surfaces exposed to plant indoor air (uncontrolled) in locations where the ambient temperature cannot be shown to be less than 95 °F. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage the hardening and loss of strength from elastomer degradation for elastomer internal surfaces exposed to ventilation atmosphere in locations where the ambient temperature cannot be shown to be less than 95 °F. In general, ambient temperature in HVAC equipment spaces is expected to be below 95 °F, in which thermal aging of elastomers is not considered significant.

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 noted that the plant-specific AMPs proposed by the applicant are the External Surfaces Monitoring and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Programs. The staff reviewed the External Surfaces Monitoring Program and finds that it performs periodic visual inspections of external surfaces during system engineer walkdowns. These walkdowns are performed at least every refueling outage. The staff also reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of component intended function. The staff's evaluation of the External Surfaces Monitoring and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Programs is documented in SER Sections 3.0.3.1.5 and 3.0.3.1.7, respectively.

In LRA Table 3.3.1, item 11, the applicant credited an exception to the GALL Report for duct flex connections in the control building HVAC system, where the temperature is less than 95 °F.

By letter dated August 31, 2007, the applicant amended the LRA to remove this exception from LRA Table 3.3.1, item 11.

GALL Report, item VII.F1-7, specifies hardening and loss of strength as the aging mechanism for item 11. However, the GALL Report also states that if the temperature threshold is not exceeded, that elastomer thermal aging is insignificant. Therefore, on this basis, the staff finds that the deletion of this exception is acceptable because it makes the line consistent with the GALL Report. The staff requested that the applicant identify where the flex connections were located.

In its response, the applicant stated that these flex connections are associated with the Halon cylinder banks located in the auxiliary building, communications corridor and control building. The applicant stated that the general thermal environment in the control building is maintained below 95 °F and the general thermal environment in the auxiliary building is less than 104 °F. Thus, the applicant stated that it must consider thermal aging for Halon cylinder flexible hoses in the auxiliary building and communications corridor because it cannot be shown that the equipment spaces are maintained below 95 °F.

The applicant credited the Fire Protection Program to manage the aging effect of hardening and loss of strength for these flex hoses. By letter dated August 31, 2007, the applicant amended LRA Table 3.3.1, Item 11, to credit the Fire Protection Program. LRA Section 3.3.2.2.5.1 was amended to add the following paragraph.

> The Fire Protection Program (B2.1.12) will manage the hardening and loss of strength from elastomer degradation for Halon fire suppression system flexible hoses not periodically replaced in locations where the ambient temperature cannot be shown to be less than 95 °F.

The staff noted that the Fire Protection Program will be enhanced to include visual inspections of Halon tank flexible hoses for hardening or loss of strength. The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11.

The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage hardening and loss of strength due to elastomer degradation in elastomer seals and components of heating and ventilation systems exposed to an internal and external environment of uncontrolled indoor air.

(2) LRA Section 3.3.2.2.5 addresses hardening and loss of strength due to elastomer degradation in elastomer linings in spent FPCCSs. The applicant stated that this aging effect is not applicable because WCGS does not have elastomer lined components exposed to treated water or treated borated water in the FPCCS that are within the scope of license renewal. Therefore, the applicable GALL Report line items were not used.

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 FPCCSs (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 noted that this item is applicable to elastomer linings. On the basis that WCGS does not have elastomer lined components exposed to treated water or treated borated water in the FPCCS that are within the scope of license renewal, the staff finds that this item is not applicable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.5 criteria. For those line items that apply to LRA Section 3.3.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.6 Reduction of Neutron-Absorbing Capacity and Loss of Material Due to General Corrosion

The staff reviewed LRA Section 3.3.2.2.6 against the criteria in SRP-LR Section 3.3.2.2.6.

LRA Section 3.3.2.2.6 addresses reduction of neutron-absorbing capacity and loss of material due to general corrosion. The applicant stated that the original boraflex spent fuel pool racks were replaced in 1999 with boral spent fuel pool racks. The WCGS Technical Specifications, Section 4.3, require that the spent fuel storage racks be maintained for reactivity (k-effective) at or below 0.95 if fully flooded with unborated water. This threshold includes an allowance for uncertainties as described in USAR Section 9.1A. The applicant stated that the new racks are designed, fabricated, and installed to ensure operation for a period of 60 years. Amendment No. 120 incorporated this modification into the WCGS operating license. In regard to the boral spent fuel pool racks modification, WCGS responded to an RAI from the NRC stating that there is no net loss of aluminum cladding during the passivation process in which aluminum slightly corrodes before forming an impervious hydrated aluminum oxide film. The response also noted that, since operational experience shows no degradation of neutron absorption capability for boral exposed to spent fuel pool environments, no special corrosion measures are necessary. The NRC SER dated March 22, 1999, agreed that the materials for the new racks were compatible with the environment in the spent fuel pool, and that the racks would not undergo material degradation which could affect their ability to safely store fuel.

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 the SER dated March 22, 1999. Based on the design, fabrication, and installation of the new racks, the staff finds that there are no aging effects that need aging management for boral spent fuel racks in a borated water environment. The staff reviewed the operating experience since the new racks were installed and found no issues related to age related degradation of these new racks. Therefore, the staff finds this item acceptable.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.6 criteria.

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 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 in stainless steel piping and components in the RCP oil collection system exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in carbon steel (including galvanized) and cast iron components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate. For the RCP lubricating oil collection system, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage loss of material due to general, pitting, and crevice corrosion for carbon steel 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 RCP 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 RCP 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 Lubricating Oil Analysis Program and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The One-Time Inspection Program verifies the effectiveness of the Lubricating Oil Analysis Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff determines that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements, including the tubing, valves, and tanks in the RCP oil collection system, exposed to lubricating oil.

The staff noted that the RCP oil collection system environment is potentially contaminated oil that is not managed by the Lubricating Oil Analysis Program. Instead, the applicant proposed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage the aging effect of loss of material. The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss component intended function. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements, including the tubing, valves, and tanks in the RCP oil collection system, exposed to potentially contaminated lubricating oil.

(2) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in steel piping and components in BWR reactor water cleanup and shutdown cooling systems exposed to treated water. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 noted that this item is applicable to steel piping and components in BWRs and; therefore, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

(3) LRA Section 3.3.2.2.7 addresses loss of material due to general, pitting, and crevice corrosion in steel diesel exhaust piping and components exposed to diesel exhaust. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage the loss of material from general (carbon steel (including galvanized) and cast iron only), pitting, and crevice corrosion for stainless steel, carbon steel (including galvanized) and cast iron internal surfaces exposed to ventilation atmosphere, wetted gas, and diesel exhaust.

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 noted that the plant-specific program proposed by the applicant is the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in stainless steel, carbon steel (including galvanized), and cast iron internal surfaces exposed to ventilation atmosphere, wetted gas, and diesel exhaust.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.7 criteria. For those line items that apply to LRA Section 3.3.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.8 Loss of Material Due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.8 against the criteria in SRP-LR Section 3.3.2.2.8.

LRA Section 3.3.2.2.8 addresses loss of material due to general, pitting, crevice, and MIC. The applicant stated that the Buried Piping and Tanks Inspection Program will manage this aging effect in the carbon steel external surfaces of buried components (including cast iron and ductile iron). The buried steel piping applicable to this item in WCGS is coated and/or wrapped in accordance with industry standards. A review of plant-specific operating history indicated one case of a pin hole leak failure of a fire protection system piping that is within the scope of license renewal. The failure resulted from a loss of material due to external pitting corrosion underneath a holiday (discontinuity) in the protective coating, which was subsequently weld repaired. In addition, the applicant stated that WCGS does not have any documented below grade aggressive environment conditions, and that although all buried piping within the scope of license renewal is protected by the cathodic protection system, no credit is taken for this for aging management. Based on the above discussion, the applicant concluded that application of the wrapping and/or coating, and programmatic inspection of their condition will be adequate to manage loss of material due to external corrosion.

SRP-LR Section 3.3.2.2.8 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. Buried piping and tanks inspection programs rely on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and operating experience with buried components, ensuring that loss of material does not occur.

The staff reviewed the Buried Piping and Tanks Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The applicant stated that an opportunistic or planned inspection will be performed during the 10-year period before entering the period of extended operation. The staff's evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.1.4. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion, and MIC in steel piping (with or without coating or wrapping), piping components, and piping elements buried in soil.

Based on the program identified above, the staff concludes that the applicant's program meet SRP-LR Section 3.3.2.2.8 criteria. For those line items that apply to LRA Section 3.3.2.2.8, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.9 Loss of Material Due to General, Pitting, Crevice, Microbiologically-Influenced Corrosion and Fouling

The staff reviewed LRA Section 3.3.2.2.9 against the following 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 MIC and fouling in steel piping and components exposed to fuel oil. The applicant stated that the Fuel Oil Chemistry and the One-Time Inspection Programs will manage this aging effect in carbon steel components in the fuel oil system. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations and tank bottoms).

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel piping, piping components, piping elements, and tanks exposed to fuel oil. The existing AMP relies on fuel oil chemistry programs to monitor and control fuel oil contamination to manage loss of material due to corrosion or fouling. Corrosion or fouling may occur at locations where contaminants accumulate. The effectiveness of fuel oil chemistry programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, MIC, and fouling to verify the effectiveness of fuel oil chemistry programs. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff reviewed the Fuel Oil Chemistry Program and finds that it includes monitoring and controlling fuel oil contaminants, draining, cleaning, visual inspection of fuel oil tanks, and inspection of new fuel oil before it is introduced into storage tanks. The staff finds that the One-Time Inspection Program is used to verify the effectiveness of the Fuel Oil Chemistry Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Fuel Oil Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.13 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion, and MIC and fouling in steel piping and components exposed to fuel oil.

(2) LRA Section 3.3.2.2.9 addresses loss of material due to general, pitting, crevice, and MIC and fouling in steel heat exchanger components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

SRP-LR Section 3.3.2.2.9 states that loss of material due to general, pitting, and crevice corrosion, MIC, and fouling may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of 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 Lubricating Oil Analysis Program and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff finds that the One-Time Inspection Program is used to verify the effectiveness of the Lubricating Oil Analysis Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion, and MIC and fouling in steel heat exchanger components exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.9 criteria. For those line items that apply to LRA Section 3.3.2.2.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.10 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.10 against the following 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 in elastomer lined and stainless steel clad components exposed to treated water or treated borated water. The applicant stated that this aging effect is not applicable because WCGS does not have components constructed of steel with elastomer lining or steel with stainless steel cladding exposed to treated water or treated borated water in the FPCCS that are within the scope of license renewal. Therefore, the applicable GALL Report line items were not used.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding exposed to treated water and treated borated water if the cladding or lining is degraded. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that this item is applicable to steel piping with elastomer lining or stainless steel cladding. On the basis that WCGS does not have steel piping with elastomer lining or stainless steel cladding exposed to treated water or treated borated water in the FPCCS that are within the scope of license renewal, the staff finds that this line is not applicable to WCGS.

(2) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel, aluminum, and stainless steel clad heat exchanger components exposed to treated water. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel and aluminum piping, piping components, piping elements, and for stainless steel and steel with stainless steel cladding heat exchanger components exposed to treated water. The existing AMP monitors and controls reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities in crevices and with stagnant flow conditions may cause pitting or crevice corrosion; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of water chemistry control programs. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion does not occur and that component intended functions will be maintained during the period of extended operation.

The staff noted that this item is applicable to BWR reactor water cleanup, shutdown cooling, and spent FPCCS components and; therefore, is not applicable WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

(3) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in copper alloy HVAC piping and components exposed to condensation (external). The applicant stated that the External Surfaces Monitoring Program will manage this aging effect in copper, copper alloy, copper-nickel, and brass external surfaces exposed to plant indoor air. The Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components Program will manage this aging effect in copper, copper alloy, copper-nickel, and brass internal surfaces exposed to ventilation atmosphere.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy HVAC piping, piping components, and piping elements exposed to condensation (external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff noted that the plant-specific AMPs proposed by the applicant are the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components and the External Surfaces Monitoring Programs.

The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of component intended function.

The staff reviewed the External Surfaces Monitoring Program and finds that it performs periodic visual inspections of external surfaces during system engineer walkdowns. These walkdowns are performed during, at least, every refueling outage.

In LRA Tables 3.3.2-8, 3.3.2-9, 3.3.2-10, and 3.3.2-12, the applicant credited the External Surface Monitoring Program to manage loss of material in external surfaces of heat exchanger tube side component exposed to a plant indoor air environment. The staff requested that the applicant clarify how a visual inspection of external surfaces during a system walkdown will identify the aging effect on a tube side component which would be inside a heat exchanger.

In its response, the applicant stated that the heat exchanger tube side components are not heat exchanger tubes, but part of the heat exchanger header assembly. However, the applicant stated that a review of the drawings showed that the header assembly protrudes only about 3 inches outside the ducting. Therefore, the majority of the header assembly is located inside the ducting.

By letter dated August 31, 2007, the applicant amended the LRA to place these components in an environment of external ventilation atmosphere. The applicant credited the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage the aging effects of loss of material in these components.

On the basis that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs visual inspections of internal surfaces when the component is disassembled during maintenance activities or during surveillance procedures, the staff finds this response acceptable.

The staff's evaluation of the External Surfaces Monitoring and the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Programs is documented in SER Sections 3.0.3.1.5 and 3.0.3.1.7, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion in external surfaces of copper alloy HVAC piping and components exposed to condensation.

(4) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in copper alloy piping and components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage loss of material due to pitting and crevice corrosion for copper, bronze, and brass components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

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 the Lubricating Oil Analysis Program and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff noted that the One-Time Inspection Program is used to verify the effectiveness of the Lubricating Oil Analysis Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion in copper, bronze, and brass components exposed to lubricating oil.

(5) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in HVAC aluminum piping and components and stainless steel ducting and components exposed to condensation. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage this aging effect in stainless steel internal surfaces exposed to wetted gas.

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 noted that the plant-specific program proposed by the applicant is the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and that it is adequate to manage loss of material due to pitting and crevice corrosion in HVAC aluminum piping and components and stainless steel ducting and components exposed to condensation.

(6) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in copper alloy piping and components exposed to internal condensation. The applicant stated that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage this aging effect in bronze internal surfaces exposed to wetted gas.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff noted that the plant-specific program proposed by the applicant is the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion in copper alloy piping and components exposed to internal condensation.

(7) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel piping and components exposed to soil. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel components exposed to soil in the OCCW, ultimate heat sink, fire protection, diesel fuel oil, or EDG systems that are within the scope of license renewal. Therefore, the applicable GALL Report line items were not used.

SRP-LR Section 3.3.2.2.10 states that loss of material due to pitting and crevice corrosion may occur in stainless steel piping, piping components, and piping elements exposed to soil. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff noted that this item applies to stainless steel piping, piping components, and piping elements exposed to soil. On the basis that WCGS does not have stainless steel components exposed to soil in the open cycle cooling water, ultimate heat sink, fire protection, diesel fuel oil, or EDG systems that are within the scope of license renewal, the staff finds that this line item is not applicable to WCGS.

(8) LRA Section 3.3.2.2.10 addresses loss of material due to pitting and crevice corrosion in stainless steel piping and components of BWR standby liquid control system exposed to sodium pentaborate. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 noted that this item applies to BWR systems and; therefore, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.10 criteria (as applicable). For those line items that apply to LRA Section 3.3.2.2.10, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.11 Loss of Material Due to Pitting, Crevice, and Galvanic Corrosion

The staff reviewed LRA Section 3.3.2.2.11 against the criteria in SRP-LR Section 3.3.2.2.11.

LRA Section 3.3.2.2.11 addresses loss of material due to pitting, crevice, and galvanic corrosion. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 noted that this item applies to BWR systems and; therefore, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on its review and confirmation above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.11 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.12 Loss of Material Due to Pitting, Crevice, and Microbiologically-Influenced Corrosion

The staff reviewed LRA Section 3.3.2.2.12 against the following 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 MIC in stainless steel, aluminum, and copper alloy piping and components exposed to fuel oil. The applicant stated that the Fuel Oil Chemistry and the One-Time Inspection Programs will manage this aging effect in stainless steel and brass components exposed to fuel oil. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations).

    SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. The existing AMP relies on the fuel oil chemistry program for monitoring and control of fuel oil contamination to manage loss of material due to corrosion; however, corrosion may occur at locations where contaminants accumulate and the effectiveness of fuel oil chemistry control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the fuel oil chemistry control program. A one-time inspection of 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 Fuel Oil Chemistry Program and finds that it includes monitoring and controlling fuel oil contaminants, draining, cleaning and visual inspection of fuel oil tanks, and inspection of new fuel oil before it is introduced into storage tanks. The staff finds that the One-Time Inspection Program is used to verify the fuel oil chemistry. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Fuel Oil Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.13 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting, crevice, and MIC in stainless steel, aluminum, and copper alloy piping and components exposed to fuel oil.

(2) LRA Section 3.3.2.2.12 addresses loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in stainless steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate. For the RCP lubricating oil collection system, the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage this aging effect in stainless steel components exposed to lubricating oil.

SRP-LR Section 3.3.2.2.12 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The existing program periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of lubricating oil programs. A one-time inspection of 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 Lubricating Oil Analysis Program and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff finds that the One-Time Inspection Program is used to verify the effectiveness of the Lubricating Oil Analysis Program. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil.

The staff noted that the environment for the RCP lubricating oil collection system is contaminated oil and is not within the scope of the Lubricating Oil Analysis Program. Instead, the applicant proposed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program to manage the aging effects of loss of material. The staff reviewed the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program and finds that it performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss component intended function. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to contaminated lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.3.2.2.12 criteria. For those line items that apply to LRA Section 3.3.2.2.12, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.13 Loss of Material Due to Wear

The staff reviewed LRA Section 3.3.2.2.13 against the criteria in SRP-LR Section 3.3.2.2.13.

LRA Section 3.3.2.2.13 addresses loss of material due to wear. The applicant stated that this aging effect is not applicable because WCGS does not have in-scope elastomer components exposed to air - indoor uncontrolled (internal or external) with relative motion with other components to produce an aging effect of loss of material due to wear; therefore, the applicable GALL Report line items were not used.

SRP-LR Section 3.3.2.2.13 states that loss of material due to wear may occur in the elastomer seals and components exposed to air - indoor uncontrolled (internal or external). The GALL Report recommends further evaluation to ensure that these aging effects are adequately managed.

The staff noted that this item applies to elastomer seals. On the basis that WCGS does not have elastomer components with relative motion with other components that are exposed to an internal and external environment of indoor uncontrolled air, the staff finds that it is not plausible to have an aging effect of loss of material due to wear. The staff finds that this aging effect is not applicable to this component type.

Based on its review and confirmation above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.13 criteria. The staff determines that the LRA is consistent with the

GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.14 Loss of Material Due to Cladding Breach

The staff reviewed LRA Section 3.3.2.2.14 against the criteria in SRP-LR Section 3.3.2.2.14.

LRA Section 3.3.2.2.14 addresses loss of material due to cladding breach. The applicant stated that this aging effect is not applicable because WCGS does not have pumps in the CVCS that are steel with stainless steel cladding exposed to treated borated water within the scope of license renewal. Therefore, the applicable GALL Report line item was not used.

SRP-LR Section 3.3.2.2.14 states that loss of material due to cladding breach may occur in PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The GALL Report references IN 94-63 and recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff noted that this item applies to steel charging pump casings. On the basis that WCGS does not have steel with stainless steel cladding pumps exposed to treated borated water in the CVCS that are within the scope of license renewal, the staff finds that this aging effect is not applicable to this component type.

Based on its review and confirmation above, the staff concludes that the applicant meets SRP-LR Section 3.3.2.2.14 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafey-Related Components

SER Section 3.0.4 documents the staff's evaluation of the applicant's QA program.

3.3.2.3 AMR Results Not Consistent with or Not Addressed in the GALL Report

In LRA Tables 3.3.2-1 through 3.3.2-21, 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 3.3.2-21, 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 Auxiliary Systems - Summary of Aging Management Evaluation - Fuel Handling - Fuel Storage and Handling System – 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 handling - fuel storage and handling system component groups.

In LRA Table 3.3.2-1, the applicant proposed to manage cumulative fatigue damage of spent fuel racks as a TLAA. SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA.

In LRA Table 3.3.2-1, the applicant identified no aging effects for boral neutron absorbers in an external environment of treated borated water. The boraflex spent fuel racks were replaced in 1999 with boral. This modification was incorporated in the WCGS operating license Amendment 120. Additionally, with regards to the boral spent fuel pool racks modification, the applicant stated that there is no net loss of aluminum cladding during the passivation process, in which aluminum slightly corrodes, before forming an impervious hydrated aluminum oxide film. The applicant also noted that, since operational experience does not show degradation of neutron absorption capability for boral exposed to spent fuel pool environments, no special corrosion measures are necessary. The NRC SER approving operating license Amendment 120 dated March 22, 1999, states that the staff found that the materials for the new racks were compatible with the environment in the spent fuel pool, and that the racks would not undergo material degradation which could affect their ability to safely store fuel.

Based on information provided in the SER dated March 22, 1999 and the design, fabrication, and installation of the new racks, the staff finds that there are no aging effects requiring aging management in the boral spent fuel racks exposed to a borated water environment. The staff reviewed the operating experience since the racks were installed and did not find any issues related to age related degradation.

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 Auxiliary Systems - Summary of Aging Management Evaluation - Fuel Pool Cooling and Cleanup System – LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of AMR evaluations for the FPCCS component groups.

In LRA Table 3.3.2-2, the applicant proposed to manage cracking in stainless steel closure bolting, flow element, heat exchanger tube side, expansion joint bellows, mechanical penetrations, piping, pump, thermowell, tubing, and valve component types exposed to an internal and external environment of borated water by using the Water Chemistry Program.

The staff's evaluation of the Water Chemistry Program is documented in SER Section 3.0.3.2.2. The staff finds that the Water Chemistry Program monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The Water Chemistry Program is consistent with the GALL Report, with some exceptions that are applicable to the steam generators only, and in accordance with the latest revision of the EPRI water chemistry guidelines.

The staff finds that the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.3. The staff confirms that the FPCCS is included within the scope of the One-Time Inspection Program, where enhanced visual (i.e., VT-1 or equivalent) and/or volumetric (i.e., RT or UT) inspections are performed to detect cracking.

On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of cracking in stainless steel components exposed to an internal and external environment of borated water will be adequately managed using the Water Chemistry and One-Time Inspection Programs.

In LRA Table 3.3.2-2, the applicant proposed to manage loss of pre-load in stainless steel closure bolting exposed to an exterior environment of treated borated water or borated water leakage using the Bolting Integrity Program.

The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The staff finds that the Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel closure bolting exposed to an exterior environment of treated borated water or borated water leakage will be adequately managed by using the Bolting Integrity Program.

In LRA Table 3.3.2-2, the applicant proposed to manage reduction of heat transfer in stainless steel heat exchanger tube sides exposed to an internal environment of treated borated water by using the Water Chemistry and One-Time Inspection Programs.

The staff's evaluation of the Water Chemistry and One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that the

Water Chemistry Program monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The Water Chemistry Program is consistent with the GALL Report, with some exceptions that are applicable to the steam generators only, and in accordance with the latest revision of the EPRI water chemistry guidelines. The staff confirms that the FPCCS is included within the scope of the One-Time Inspection Program, where enhanced visual (i.e., VT-1 or equivalent) and/or volumetric (i.e., RT or UT) inspections are performed to detect reduction of heat transfer. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of reduction of heat transfer in stainless steel heat exchanger tube side components exposed to an internal environment of borated water will be adequately managed using the Water Chemistry and One-Time Inspection Programs.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.3 Auxiliary Systems - Summary of Aging Management Evaluation - Essential Service Water System – LRA Table 3.3.2-3

The staff reviewed LRA Table 3.3.2-3, which summarizes the results of AMR evaluations for the ESWS component groups.

In LRA Table 3.3.2-3, the applicant proposed to manage loss of pre-load in carbon steel closure bolting exposed to an exterior environment of atmosphere weather using the Bolting Integrity Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The staff finds that the Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that the program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in carbon steel closure bolting exposed to an exterior environment of atmosphere weather will be adequately managed by using the Bolting Integrity Program.

The staff noted that in LRA Table 3.3.2-3, the applicant identified no aging effects for stainless steel flow element exposed to an exterior environment of atmosphere weather. The staff finds that stainless steel material is susceptible to aging only if exposed to an aggressive chemical, salt water or buried environments. In a normal atmosphere environment, where rain water would tend to wash the exterior surface material rather than concentrate contaminants, the stainless steel material will have no aging effects. On this basis, the staff finds that stainless steel in an atmosphere weather environment exhibits no aging effect, and that the component or structure will remain capable of performing its intended functions consistent with the CLB 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).

3.3.2.3.4 Auxiliary Systems - Summary of Aging Management Evaluation - Component Cooling System – LRA Table 3.3.2-4

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of AMR evaluations for the component cooling system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-4 are consistent with 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 Auxiliary Systems - Summary of Aging Management Evaluation - Containment Cooling Water System – LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of AMR evaluations for the containment cooling water system component groups.

In LRA Table 3.3.2-5, the applicant identified no aging effects for stainless steel instrument bellows, piping, and tubing exposed to a silicone fluid environment. The staff finds that the silicone fluid associated with the containment water cooling system is nearly chemically inert and has no adverse effect on metals such as aluminum and stainless steel. 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 its intended functions consistent with the CLB 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).

3.3.2.3.6 Auxiliary Systems - Summary of Aging Management Evaluation - Compressed Air System – LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the compressed air system component groups.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of pre-load in copper alloy closure bolting exposed to an exterior environment of plant indoor air by using the Bolting Integrity Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in copper alloy closure bolting exposed to an exterior environment of plant indoor air will be adequately managed by using the Bolting Integrity Program.

In LRA Table 3.3.2-6, the applicant proposed to manage loss of material in carbon steel piping and valves exposed to an interior environment of plant indoor air by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in carbon steel piping and valves exposed to an interior environment of plant indoor air will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

In LRA Table 3.3.2-6, the applicant identified no aging effects for stainless steel piping exposed to an interior environment of plant indoor air. The staff finds that stainless steel is highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which would be reflective of an indoor uncontrolled air), as cited in the American Society for Metals International, Metals Handbook, Volumes 3 and 13, dated 1980 and 1987, respectively. The staff finds that components are not subject to moisture in a dry air environment and that indoor uncontrolled air would have limited humidity and condensation. Therefore, the staff finds that stainless steel in an indoor, uncontrolled air environment exhibits no aging effects, and the component or structure will remain capable of performing its intended functions consistent with the CLB 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).

3.3.2.3.7 Auxiliary Systems - Summary of Aging Management Evaluation - Chemical and Volume Control System – LRA Table 3.3.2-7

The staff reviewed LRA Table 3.3.2-7, which summarizes the results of AMR evaluations for the CVCS component groups.

In LRA Table 3.3.2-7, the applicant proposed to manage loss of pre-load of stainless steel closure bolting exposed externally to an exterior environment of borated water leakage by using the Bolting Integrity Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that this program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel closure bolting exposed to an exterior environment of borated water leakage will be adequately managed by using the Bolting Integrity Program.

In LRA Table 3.3.2-7, the applicant proposed to manage reduction of heat transfer and loss of material in copper-nickel and stainless steel heat exchanger tube side exposed to an internal and external environment of treated borated water by using the Water Chemistry and One-Time Inspection Programs. The staff's evaluation of the Water Chemistry and One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively.

The staff finds that the Water Chemistry Program monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The staff finds that the Water Chemistry Program is consistent with the GALL Report, with some exceptions which are applicable to steam generators only, and in accordance with the latest revision of the EPRI water chemistry guidelines. The staff also confirmed that the CVCS is included within the scope of the One-Time Inspection Program, where enhanced visual (i.e., VT-1 or equivalent) and/or volumetric (i.e., RT or UT) inspections are performed to detect reduction of heat transfer. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of reduction of heat transfer and loss of material in stainless steel heat exchanger tube side components exposed to an internal environment of borated water is effectively managed by using the Water Chemistry and One-Time Inspection Programs.

In LRA Table 3.3.2-7, the applicant stated that cumulative fatigue damage of stainless steel heat exchangers exposed to an internal environment of treated borated water is a TLAA. The applicant applied note I for this item and referenced a GALL Report, Volume 2 item and a Table 3.3.1 item. Since note I implies that this line item is not consistent with the GALL Report, the staff requested that the applicant explain why a GALL Report, Volume 2 item and a Table 3.3.1 item were referenced in this item.

In its response, the applicant stated that no vessel, tank, pump, or heat exchanger designs at WCGS are supported by TLAAs as defined in 10 CFR 54.3, except ASME Code Class 1, components and the Class 2 portions of the steam generators. The applicant stated that the design of this WCGS component is not supported by TLAAs.

By letter dated August 31, 2007, the applicant amended LRA Table 3.3.2-7 to delete this TLAA item and notes I and 7. On the basis that there is no TLAA for this line item, the staff finds that deletion of this line item is acceptable.

In LRA Table 3.3.2-7, the applicant identified no aging effects for copper alloy sight glass and valve exposed to an interior environment of plant indoor air. The applicant applied notes G and 1 for this item. However, in other tables, the applicant referenced a GALL Report, Volume 2 item and applied note A, which implies that the item is consistent with the GALL Report. The staff requested that the applicant clarify this discrepancy.

By letter dated August 31, 2007, the applicant amended the LRA to change this line item to reference note A and GALL Report, item VIII.I-2. The staff finds that the GALL Report line item applies to copper alloy piping, piping components, and piping elements in an environment of uncontrolled indoor air with no aging effects and no aging management recommended. On the basis that the line item is now consistent with the GALL Report, the staff finds the applicant's response acceptable.

In LRA Table 3.3.2-7, the applicant identified no aging effects for insulation material comprised of aluminum, stainless steel, calcium silicate, and foamglass in a plant indoor air environment. The applicant applied note 6 indicating that this thermal insulation is located in an indoor non-aggressive environment (i.e., the insulation is not exposed to contaminants). On the basis of its review of current industry research and operating experience, the staff finds that plant indoor air on thermal insulation material will not result in aging that will be of concern 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).

3.3.2.3.8 Auxiliary Systems - Summary of Aging Management Evaluation - Auxiliary Building HVAC System – LRA Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the auxiliary building HVAC system component groups.

The staff noted that in LRA Table 3.3.2-8, the applicant proposed to manage loss of material in copper-alloy valves exposed to an internal environment of demineralized water by using the Water Chemistry and One-Time Inspection Programs.

The staff's evaluation of the Water Chemistry and One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that the Water Chemistry Program monitors chlorides, fluorides, and dissolved oxygen to limit the contaminants, thus, minimizing the occurrences of aging effects and maintaining the component's ability to perform its intended functions. The staff finds that the Water Chemistry Program is consistent with the GALL Report, with some exceptions that are applicable to steam generators only, and in accordance with the latest revision of the EPRI water chemistry guidelines. The staff also confirmed that the auxiliary building HVAC system is included within the scope of the One-Time Inspection Program, where enhanced visual (i.e., VT-1 or equivalent) and/or volumetric (i.e., RT or UT) inspections are performed to detect loss of material. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in copper-alloy valves exposed to an internal environment of demineralized water will be adequately managed by using the Water Chemistry and One-Time Inspection Programs.

In LRA Table 3.3.2-8, the applicant identified no aging effects for copper heat exchanger tube sides exposed to an exterior environment of plant indoor air. The staff noted that ASTM comprehensive tests conducted over a 20-year period have confirmed the suitability of copper and copper alloys for atmospheric exposure as referenced in the American Society for Metals International, Metals Handbook, Volume 13, dated 1987. Therefore, the staff finds that copper in an indoor air internal environment has no aging effect.

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 Auxiliary Systems - Summary of Aging Management Evaluation - Control Building HVAC System – LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of AMR evaluations for the control building HVAC system component groups.

In LRA Table 3.3.2-9, the applicant identified no aging effects for elastomers flex connectors exposed to an exterior environment of plant indoor air. The applicant applied note I and referenced a GALL Report item and a Table 1 item. Since note I implies that this line item is not consistent with the GALL Report, the staff requested that the applicant clarify why a GALL Report item and a Table 1 item was referenced.

In its response, the applicant stated that flexible connectors for the control building HVAC system are synthetic elastomers (i.e., neoprene) exposed to an uncontrolled indoor air environment. The general thermal environment in the control building is maintained below 95 °F. The aging effect listed for GALL Report, item VII.F1-7, is hardening and loss of strength, elastomer degradation. The GALL Report defines elastomers as:

> Materials rubber, EPT, EPDM, PTFE, ETFE, viton, vitril, neoprene, and silicone elastomer. Hardening and loss of strength of elastomers can be induced by elevated temperature (over about 95 °F (35 °C), and additional aging factors such as exposure to ozone, oxidation, and radiation.

The applicant stated that the GALL Report defines uncontrolled indoor air with temperatures above 95 °F and discusses the temperature threshold for elastomer thermal aging by stating:

> If ambient is <95 °F, then any resultant thermal aging of organic materials can be considered to be insignificant, over the 60-year period of interest." The EPRI guideline, Non-Class 1 Mechanical Implementation Guideline and Mechanical Tools, Appendix D Section 2.1.8, states in part that, "synthetic rubbers are not affected by ozone and are typically much more resistant to sunlight (or other forms of ultraviolet radiation).

The staff noted that GALL Report, item VII.F1-7, specifies hardening and loss of strength as the aging mechanism. However, the GALL Report also states that if the temperature threshold is not exceeded, that elastomer thermal aging is insignificant. The EPRI guide states that synthetic rubbers such as neoprene are not affected by ozone, sunlight, or other forms of ultraviolet radiation. Therefore, the staff finds that hardening and loss of strength of the control building HVAC flexible connectors is not expected.

By letter dated August 31, 2007, the applicant amended the LRA as follows:

LRA Table 3.3.2-9, Control Building HVAC System, Component Type "Flexible Connectors" was amended to eliminate reference to GALL line VII.F1-7. A Non-GALL row was created. The Non-GALL row has the identical material, environment, aging effect, and AMP as currently listed for the flexible connectors. The footnote was revised to "H,1." Note 1 was included describing why these elastomers are not subject to hardening (similar to discussion above).

LRA Table 3.3.1, item 3.3.1.11, was amended to remove discussion of the exception to NUREG-1801 for control building flexible connectors.

On the basis of its review, the staff finds this response acceptable because hardening and loss of strength of the control building HVAC flexible connectors is not expected.

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 Auxiliary Systems - Summary of Aging Management Evaluation - Fuel Building HVAC System – LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the fuel building HVAC system component groups.

In LRA Table 3.3.2-10, the applicant applied note A for carbon steel adsorber in an internal environment of ventilation atmosphere; however, a GALL Report item and a Table 1 item were not referenced. Since note A implies that this line is consistent with the GALL Report, the staff requested that the applicant identify the GALL Report and the Table 1 items. The staff noted that if the line is not consistent, the applicant should clarify this discrepancy.

In its response, the applicant stated that note A was inadvertently used. Unlike other carbon steel ventilation components, it is unlikely that an adsorber would have condensation as an internal environment. The adsorbers first stage contains moisture separators to ensure moisture does not impregnate in the charcoal filters. Therefore, a separate plant-specific aging evaluation was created.

By letter dated August 31, 2007, the LRA was amended as follows:

LRA Table 3.3.2-10, Fuel Building HVAC System, Component Type "Adsorber" was amended to use note "G,3" in lieu of note "A." A plant-specific note 3 was added that states, "GALL row VII.F2-3 has an internal environment of condensation. Unlike other carbon steel ventilation components, it is unlikely that an adsorber would have condensation as an internal environment. The adsorbers first stage contains moisture separators to ensure moisture does not impregnate the charcoal filters. Therefore, a separate (non condensation) row needed to be created."

The staff finds that a dry environment will have an insignificant aging effect on carbon steel. Carbon steel needs a wet or humid environment to generate corrosion. The GALL Report confirms that carbon steel in a dried air environment has no aging effects and that no aging management program is necessary. Since the moisture separators ensure that the air is dry, the staff finds the applicant response acceptable.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.11 Auxiliary Systems - Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building HVAC System – LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of AMR evaluations for the essential service water pumphouse building HVAC system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-11 are consistent with 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 Auxiliary Systems - Summary of Aging Management Evaluation - Miscellaneous Buildings HVAC System – LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the miscellaneous buildings HVAC system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-12 are consistent with 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 Auxiliary Systems - Summary of Aging Management Evaluation - Diesel Generator Building HVAC System – LRA Table 3.3.2-13

The staff reviewed LRA Table 3.3.2-13, which summarizes the results of AMR evaluations for the DG building HVAC system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-13 are consistent with 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 Auxiliary Systems - Summary of Aging Management Evaluation - Fire Protection System – LRA Table 3.3.2-14

The staff reviewed LRA Table 3.3.2-14, which summarizes the results of AMR evaluations for the fire protection system component groups.

In LRA Table 3.3.2-14, the applicant proposed to manage loss of material in cast iron strainer exposed to an interior environment of plant indoor air by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that the Inspection of Internal Surfaces In Miscellaneous Piping And Ducting Components Program performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in cast iron strainer exposed to an interior environment of plant indoor air will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

In LRA Table 3.3.2-14, the applicant identified no aging effects for elastomers flex hoses exposed to an exterior environment of plant indoor air and an internal environment of dry air. The applicant applied note 1, which states that ambient temperatures in these spaces is expected to be below 95 °F, and below this temperature, thermal aging is not considered significant. The staff requested that the applicant identify where these flex hoses are located in the plant since some areas could be considered to have a temperature higher than 95 °F.

In its response, the applicant stated that the flex hoses are associated with the Halon cylinder banks. Halon cylinder banks are located in the auxiliary building, communications corridor, and control building. The general thermal environment in the control building is maintained below 95 °F. The general thermal environment in the auxiliary building is less than 104 °F. However, flexible hoses for Halon storage cylinders in areas other than the control building may exceed the temperature threshold for elastomer degradation.

The staff finds that for Halon cylinder flexible hoses in the auxiliary building and communications corridor, thermal aging must be considered because it cannot be shown that the equipment spaces for these components are maintained below 95 °F.

By letter dated August 31, 2007, the LRA was amended as follows:

> LRA Table 3.3.2-14, Fire Protection System, Component Type "Flexible Hoses" (control building), environment "dry gas" will be amended to use note G,1 in lieu of note J. Plant-specific note 1 will be amended to state, "Ambient temperature in control building spaces is expected to be below 95 °F. Below 95 °F, thermal aging of elastomers is not considered significant."
>
> LRA Table 3.3.2-14, Fire Protection System, Component Type "Flexible Hoses" (control building), environment "plant indoor air" will be amended to use note G,1 in lieu of note J. plant-specific note 1 will be amended to state, "Ambient temperature in control building spaces is expected to be below 95 °F degrees. Below 95 °F degrees, thermal aging of elastomers is not considered significant."

The staff noted that the GALL Report defines uncontrolled indoor air as temperature greater than 95 °F. The GALL Report also discusses the temperature threshold for elastomer thermal aging by stating "If ambient is <95 °F, then any resultant thermal aging of organic materials can be considered to be insignificant, over the 60-year period of interest." On this basis, the staff finds that plant indoor air and dry air on elastomers in the control building will not result in aging that will be of concern during the period of extended operation.

By letter dated August 31, 2007, the LRA was amended to add the following component:

Component type: "Flexible Hoses" (auxiliary building/communications corridor)
Material: Elastomer
Environment: Plant indoor air (external)
Aging Effect: Hardening and loss of strength - elastomer degradation
Aging Management Program: XI.M26 - Fire Protection
NUREG-1801 Volume 2 No.: VII.F2-7
Table 1 Item: 3.3.1.11
Note: E,3
Plant-specific Note 3: Thermal aging of Halon flexible hoses in the auxiliary building and communication corridor must be considered because it cannot be shown that these areas are below 95 °F.

Component type: "Flexible Hoses" (auxiliary building/communications corridor)
Material: Elastomer
Environment: Dry gas (internal)
Aging Effect: Hardening and loss of strength - elastomer degradation
Aging Management Program: XI.M26 - Fire Protection
NUREG-1801 Volume 2 No.: None
Table 1 Item: None
Note: G,3
Plant-specific Note3: Thermal aging of Halon flexible hoses in the auxiliary building and communication corridor must be considered because it cannot be shown that these areas are below 95 °F.

The staff finds that since the environment indicates that the general temperature in the area could be greater than 95 °F, hardening and loss of strength will be an aging effect requiring management for elastomer flex hoses. The hoses will be visually inspected on a periodic basis as part of the Fire Protection Program. The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11.

In LRA Table 3.3.2-14, the applicant identified no aging effects for copper alloy and bronze spray nozzles and valves exposed to an interior environment of plant indoor air. This line item is similar to GALL Report, item VIII.I-2, which is for copper alloy piping, piping components, and piping elements in an external environment of air-indoor uncontrolled. On the basis that the LRA item is similar to the GALL Report item for that material and environment, the staff finds that plant indoor air on copper alloy and bronze material will not result in aging that will be of concern 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).

3.3.2.3.15 Auxiliary Systems - Summary of Aging Management Evaluation - Emergency Diesel Engine Fuel Oil Storage and Transfer System – LRA Table 3.3.2-15

The staff reviewed LRA Table 3.3.2-15, which summarizes the results of AMR evaluations for the emergency diesel engine fuel oil storage and transfer system component groups.

In LRA Table 3.3.2-15, the applicant proposed to manage loss of pre-load of carbon steel closure bolting exposed to an exterior environment of atmosphere weather and fuel oil by using the Bolting Integrity Program. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The staff finds that the Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that the program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in carbon steel closure bolting exposed to an exterior environment of atmosphere weather and fuel oil will be adequately managed by using 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 generically 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 Auxiliary Systems - Summary of Aging Management Evaluation - Emergency Diesel Engine System – LRA Table 3.3.2-16

The staff reviewed LRA Table 3.3.2-16, which summarizes the results of AMR evaluations for the emergency diesel engine system component groups.

In LRA Table 3.3.2-16, the applicant identified no aging effects for copper alloy valves exposed to an exterior environment of plant indoor air. The applicant applied notes G and 3 for this line item. However, in other tables, the applicant referenced a GALL Report, Volume 2, item and applied note A, which implies that the item is consistent with the GALL Report. The staff requested that the applicant clarify this discrepancy.

By letter dated August 31, 2007, the applicant amended the LRA to change this line item to reference note A and GALL Report, item VIII.I-2. The staff finds that the GALL Report line item applies to copper alloy piping, piping components, and piping elements in an environment of air indoor uncontrolled with no aging effects and no aging management recommended. On the basis that the line item is now consistent with the GALL Report, the staff finds the response acceptable.

In LRA Table 3.3.2-16, the applicant identified no aging effects for ceramic fiber insulation in a plant indoor air environment. The applicant applied note 2 for this line item; however, note 2 does not include ceramic fiber insulation. The staff requested that the applicant define this insulation, explain where it is utilized in the plant, and confirm if note 2 applies.

In its response, the applicant stated that the ceramic fiber insulation is made of Kaowool ceramic fiber blanket, and used for a DG exhaust line at the penetration of the DG room to prevent overheat of the surrounding concrete.

By letter dated August 31, 2007, the applicant amended LRA Table 3.3.2-16, note 2, as follows:

> NUREG-1801 does not consider mechanical insulation. The in-scope thermal insulation is located in areas with non-aggressive environments (meaning the insulation is not exposed to contaminants). Based on the review of the site operating experience, it was determined that for stainless steel insulation, closed cell foam, quilted fiberglass insulation, calcium silicate, ceramic fiber, and insulation jacketing in non-aggressive environments, there were no aging effects requiring management.

On the basis of its review of current industry research and operating experience, the staff finds that plant indoor air is considered a non-aggressive environment on thermal insulation material and will not result in aging effects that will be of concern during the period of extended operation.

By letter dated August 31, 2007, the applicant amended the LRA to add the component type of elastomer material flex connectors exposed to an internal environment of fuel oil and lubricating oil. The applicant identified no aging effects and applied notes G and 5. The applicant stated that the elastomer material used is nitrile rubber, which has excellent resistance to fuel oil and lubricating oil. Nitrile rubber decomposes when exposed to sunlight and ozone. However, these components are indoor in an environment of lubricating or fuel oil and; therefore, are not exposed to sunlight or ozone. Furthermore, when ambient temperature is less than 95 °F, nitrile rubber is highly resistant to thermal exposure which could cause cracking or ultimate elongation.

On the basis of its review of current industry research and operating experience, the staff finds that fuel oil or lubricating oil environment on elastomer material will not result in aging effects that will be of concern during the period of extended operation.

In LRA Table 3.3.2-16, the applicant applied note D for copper alloy heat exchanger components exposed to an external environment of lube oil; however, a GALL Report item and a Table 1 item were not referenced. The staff noted that note D implies that this line is consistent with the GALL Report. Therefore, the staff requested that the applicant identify the GALL Report and the Table 1 items. The staff stated that if the line is not consistent with the GALL Report, the applicant should clarify the discrepancy.

In its response, the applicant stated that note D was incorrectly used. The GALL Report does not consider reduction of heat transfer or fouling in copper alloy heat exchanger tubes exposed to lubricating oil. Therefore, a separate plant-specific aging evaluation was created.

By letter dated August 31, 2007, the LRA was amended as follows:

> LRA Table 3.3.2-16, Emergency Diesel Engine System, Component Type (Heat Exchanger Tube Side HX#150) is amended to use note H,4 in lieu of note D,4. Plant-specific note 4 already exists for this row. No changes to the existing plant-specific note are required.

The staff noted that this line item is now consistent with the GALL Report for plant-specific evaluation. The staff noted that in the amended LRA Table 3.3.2-16, the applicant proposed to manage reduction of heat transfer and fouling in copper alloy heat exchanger tubes exposed to an internal environment of lubricating oil by using the Lubricating Oil Analysis and the One-Time Inspection Programs. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively.

The staff finds that the Lubricating Oil Analysis Program maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff finds that the One-Time Inspection Program is a new program that, when implemented, will be consistent with the GALL Report. The staff also confirmed that the emergency diesel engine system is included within the scope of the One-Time Inspection Program, where enhanced visual (i.e., VT-1 or equivalent) and/or volumetric (i.e., RT or UT) inspections are performed to detect loss of material. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of reduction of heat transfer and fouling in copper alloy heat exchanger tubes exposed to an internal environment of lubricating oil will be adequately managed by using the Lubricating Oil Analysis and the One-Time Inspection Programs.

In LRA Table 3.3.2-16, the applicant applied note A for stainless steel valves exposed to an internal environment of wetted gas; however, a GALL Report item and a Table 1 item were not referenced. Note A implies that this line is consistent with the GALL Report. Therefore, the staff requested that the applicant identify the GALL Report and the Table 1 items. The staff noted that if the item is not consistent with the GALL Report, that the applicant should clarify the discrepancy.

In its response, the applicant stated that note A was incorrectly assigned to this aging evaluation. By letter dated August 31, 2007, the applicant amended the LRA as follows:

> LRA Table 3.3.2-16, Emergency Diesel Engine System, Component Type "Valve," environment "wetted gas" will be amended to use note G,1 in lieu of note A,1. Plant-specific note 1 already exists for this row. No changes to the existing plant-specific note are required.

The staff finds that this line item is now consistent with the GALL Report. The staff noted that in the amended LRA Table 3.3.2-16, the applicant proposed to manage loss of material of stainless steel valves exposed to an interior environment of wetted gas using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program performs periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in stainless steel valves exposed to an interior environment of wetted gas will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

By letter dated August 31, 2007, the applicant amended the LRA to add the following component:

> Component type: "Flex Connectors"
> Material: Elastomer
> Environment: Closed Cycle Cooling Water (internal)
> Aging Effect: Hardening and loss of strength - elastomer degradation
> Aging Management Program: Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)
> NUREG-1801 Volume 2 No.: None
> Table 1 Item: None
> Note: G

The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that the Inspection of Internal Surfaces In Miscellaneous Piping And Ducting Components Program includes periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. The staff confirmed that the program basis document was revised to add elastomers in closed-cycle cooling water to the material and environment list within the scope of this program. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in elastomer flex connections exposed to an internal environment of closed cycle cooling water will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components 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).

3.3.2.3.17 Auxiliary Systems - Summary of Aging Management Evaluation - Floor and Equipment Drains System – LRA Table 3.3.2-17

The staff reviewed LRA Table 3.3.2-17, which summarizes the results of AMR evaluations for the floor and equipment drains system component groups.

In LRA Table 3.3.2-17, the applicant proposed to manage loss of material in stainless steel piping exposed to an internal environment of wetted gas by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program includes periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in stainless steel piping exposed to an interior environment of wetted gas will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components 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 Auxiliary Systems - Summary of Aging Management Evaluation - Oily Waste System – LRA Table 3.3.2-18

The staff reviewed LRA Table 3.3.2-18, which summarizes the results of AMR evaluations for the oily waste system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-18 are consistent with 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 Auxiliary Systems - Summary of Aging Management Evaluation - Cranes, Hoists, and Elevator Systems – LRA Table 3.3.2-19

The staff reviewed LRA Table 3.3.2-19, which summarizes the results of AMR evaluations for the cranes, hoists, and elevator systems component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-19 are consistent with 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 Auxiliary Systems - Summary of Aging Management Evaluation - Turbine Building HVAC System – LRA Table 3.3.2-20

The staff reviewed LRA Table 3.3.2-20, which summarizes the results of AMR evaluations for the turbine building HVAC system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.3.2-20 are consistent with the GALL Report.

The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.21 Auxiliary Systems - Summary of Aging Management Evaluation - Miscellaneous Auxiliary Systems In-Scope only based on Criterion 10 CFR 54.4(a)(2) – LRA Table 3.3.2-21

The staff reviewed LRA Table 3.3.2-21, which summarizes the results of AMR evaluations for the miscellaneous auxiliary systems in-scope only based on criterion 10 CFR 54.4(a)(2) component groups.

In LRA Table 3.3.2-21, the applicant proposed to manage loss of pre-load in stainless steel and copper alloy closure bolting exposed to an external environment of borated water leakage and plant indoor air by using the Bolting Integrity Program.

The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7. The staff finds that the Bolting Integrity Program includes good bolting practices and requirements for proper disassembling, inspecting, and assembling of connections with threaded fasteners. The staff finds that the program is consistent with the recommendations of the GALL Report. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in stainless steel and copper alloy closure bolting exposed to an external environment of borated water leakage and plant indoor air will be adequately managed by using the Bolting Integrity Program.

The staff noted that in LRA Table 3.3.2-21, the applicant proposed to manage loss of material in stainless steel, carbon steel, bronze, copper and copper alloy piping, tubing, and valves exposed to an internal environment of wetted gas and potable water by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The staff's evaluation of the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program is documented in SER Section 3.0.3.1.7. The staff finds that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program includes periodic visual inspections of internal surfaces during periodic maintenance, predictive maintenance, surveillance testing, and corrective maintenance to detect aging effects that could result in a loss of the component's intended function. On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of material in stainless steel, carbon steel, bronze, copper and copper alloy piping, tubing, and valves exposed to an internal environment of wetted gas and potable water will be adequately managed by using the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

In LRA Table 3.3.2-21, the applicant identified no aging effects for polyvinyl chloride (PVC) piping and valves exposed externally to an external environment of atmosphere weather and internally to an internal environment of raw water. PVC is unaffected by water, concentrated alkalies, nonoxidizing acids, oils, ozone, sunlight, or humidity changes. Unlike metals, thermoplastics do not display corrosion rates. Rather than depend on an oxide layer for protection, they depend on chemical resistance to the environments to which they are exposed. The use of thermoplastics in a water environment is a design-driven criterion. On this basis, the staff finds that atmosphere weather and raw water environment on PVC materials will not result in aging effects that will be of concern 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).

3.3.3 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 System

This section of the SER documents the staff's review of the applicant's AMR results for the steam and power conversion system components and component groups of:

- main turbine system
- main steam
- feedwater system
- condensate system
- steam generator blowdown system
- auxiliary feedwater system

3.4.1 Summary of Technical Information in the Application

LRA Section 3.4 provides AMR results for the steam and power conversion system components and component groups. LRA Table 3.4.1, "Summary of Aging Management Evaluations in Chapter VIII of NUREG-1801 for Steam and Power Conversion System," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the steam and power conversion 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.

3.4.2 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 system components within the scope of license renewal and subject to an AMR will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.4.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.4.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.4.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's audit evaluations are summarized in SER Section 3.4.2.3. The staff's evaluation of the technical review is also 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 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 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	Consistent with GALL Report (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 (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (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	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.2.2.1)

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 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 (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (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 3.4.2.2.9)
Steel and stainless steel tanks exposed to treated water (3.4.1-6)	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Yes	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 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	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (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 micro biologically-influenced corrosion, and fouling	Plant-specific	Yes	Not applicable	Not applicable to WCGS (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	Not applicable	Not applicable to WCGS (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	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.4.2.2.4.2)

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
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 micro biologically-influ enced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	No Yes	Buried Piping and Tanks Inspection (B2.1.18)	Consistent with GALL Report (See SER Section 3.4.2.2. 5.1)
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and micro biologically-influ enced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Lubricating Oil Analysis (B2.1.23) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (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 SCC	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 SCC	Water Chemistry and One-Time Inspection	Yes	Water Chemistry (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (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	Not applicable	Not applicable to WCGS (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 (B2.1.2) and One-Time Inspection (B2.1.16)	Consistent with GALL Report (See SER Section 3.4.2.2.7.1)

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 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	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.2.7.2)
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 WCGS (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 micro biologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Yes	Not applicable	Not applicable to WCGS (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	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
High-strength steel closure bolting exposed to air with steam or water leakage (3.4.1-21)	Cracking due to cyclic loading, SCC	Bolting Integrity	No	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
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 (B2.1.7)	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
Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water > 60°C (> 140°F) (3.4.1-23)	Cracking due to SCC	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
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 WCGS (See SER Section 3.4.2.1.1)
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 WCGS See SER Section 3.4.2.1.1)
Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water (3.4.1-26)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS See Section 3.4.2.1.1)
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 WCGS See SER Section 3.4.2.1.1)
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 (B2.1.20)	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 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 (B2.1.6)	Consistent with 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	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B2.1.22)	Consistent with GALL Report
Steel heat exchanger components exposed to raw water (3.4.1-31)	Loss of material due to general, pitting, crevice, galvanic, and micro biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
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 micro biologically-influenced corrosion	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
Stainless steel heat exchanger components exposed to raw water (3.4.1-33)	Loss of material due to pitting, crevice, and micro biologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	No	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
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 WCGS (See SER Section 3.4.2.1.1)

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 > 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 WCGS (See SER Section 3.4.2.1.1)
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	Selective Leaching of Materials (B2.1.17)	Consistent with GALL Report (See SER Section 3.4.2.1.1)
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 (B2.1.2)	Consistent with GALL Report
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	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	Cracking due to SCC	Water Chemistry	No	Water Chemistry (B2.1.2)	Consistent with GALL Report
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	No	None	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
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 WCGS (See SER Section 3.4.2.1.1)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.4.1-43)	None	None	No	Not applicable	Not applicable to WCGS (See SER Section 3.4.2.1.1)
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 system 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 system 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 system components:

- Water Chemistry

- Flow-Accelerated Corrosion
- Bolting Integrity
- One-Time Inspection
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components
- Lubricating Oil Analysis

LRA Tables 3.4.2-1 through 3.4.2-6 summarize AMRs for the steam and power conversion 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 the GALL Report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also 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 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 verified whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation follows.

3.4.2.1.1 AMR Results Identified as Not Applicable

In LRA Table 3.4.1, the applicant identified items 20, 21, 23, 24, 25, 26, 27, 31, 32, 33, 34, 35, 36, 38, 40, 42, and 43 as not applicable because the component, material, and environment combination does not apply to components within the scope of license renewal at WCGS. However, as a result of the staff's review, by letter dated August 31, 2007, the applicant amended the LRA to add components within the scope of license renewal that utilize item numbers 36 and 40. These items are now applicable and have been addressed in this SER. For each of the remaining 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 WCGS. On the basis that WCGS does not have this combination, the staff finds that these AMRs are not applicable to WCGS.

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 the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.4.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the steam and power conversion system components and provides information concerning how it will manage the following aging effects and related QA:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and MIC, and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and MIC

- cracking due to SCC
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and MIC
- 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 GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.4.2.2. The staff's review of the applicant's further evaluation follows.

3.4.2.2.1 Cumulative Fatigue Damage

LRA Section 3.4.2.2.1 states that fatigue is a TLAA, as 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.

3.4.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.2 against the following 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. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage this aging effect in carbon steel components exposed to secondary water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations and tank bottoms).

SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion may occur in steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and for steel piping, piping components, and piping elements exposed to steam. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations with stagnant flow conditions; therefore, the effectiveness of water chemistry control programs should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of water chemistry control programs. A one-time inspection of 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.

In LRA Table 3.4.1, items 2 and 4, the applicant addresses loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements exposed to steam or treated water. During the audit, the staff confirmed that the applicant utilizes the Water Chemistry Program to manage these aging effects. The staff finds that the One-Time Inspection Program will be used to verify the effectiveness of the water chemistry control. This program performs inspection of selected components at susceptible locations, as recommended by the GALL Report.

The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Water Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements exposed to steam or treated water.

In LRA Table 3.4.1, item 3, the applicant stated that this item is not applicable. The applicant states that WCGS has no heat exchangers in the condensate or blowdown systems within the scope of license renewal; therefore, the applicable GALL Report lines were not used. The staff reviewed the plant basis documents and interviewed technical personnel to verify that WCGS does not has these components within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

(2) LRA Section 3.4.2.2.2 addresses loss of material due to general, pitting, and crevice corrosion in steel piping and components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

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.

In LRA Table 3.4.1, item 07, the applicant addresses loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements exposed to lubricating oil. The applicant credits the Lubricating Oil Analysis Program to manage loss of material aging effect. The One-Time Inspection Program is used to verify the effectiveness of the lube oil chemistry control by performing an inspection of selected components at susceptible locations, as recommended by the GALL Report.

The staff reviewed the Lubricating Oil Analysis Program and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.2 criteria. For those line items that apply to LRA Section 3.4.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.3 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 MIC, and fouling. The applicant stated that this aging effect is not applicable because WCGS does not have components exposed to raw water in the AFW system that are within the scope of license renewal.

SRP-LR Section 3.4.2.2.3 states that loss of material due to general, pitting, and crevice corrosion, and MIC and fouling may occur in steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

In LRA Table 3.4.1, item 8, the applicant stated that this item is not applicable. The applicant stated that there are no components exposed to raw water in the AFW system that are within the scope of license renewal; therefore, the applicable GALL Report line was not used. The staff reviewed the plant basis documents and interviewed the technical personnel to verify that WCGS does not has these components within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

Based on its review and confirmation above, the staff concludes that the applicant meets SRP-LR Section 3.4.2.2.3 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.4 Reduction of Heat Transfer Due to Fouling

The staff reviewed LRA Section 3.4.2.2.4 against the following 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. The applicant stated that this aging effect is not applicable because WCGS does not have heat exchangers in the condensate or blowdown systems, nor heat exchangers with a heat transfer intended function in the AFW system that are within the scope of license renewal.

SRP-LR Section 3.4.2.2.4 states that reduction of heat transfer due to fouling may occur in stainless steel and copper alloy heat exchanger tubes exposed to treated water. The existing AMP controls water chemistry to manage reduction of heat transfer due to fouling. However, control of water chemistry may not always be fully effective in precluding fouling; therefore, the GALL Report recommends that the effectiveness of water chemistry control programs should be verified to ensure that reduction of heat transfer due to fouling does not occur. A one-time inspection is an acceptable method to ensure that reduction of heat transfer does not occur and that component intended functions will be maintained during the period of extended operation.

In LRA Table 3.4.1, item 9, the applicant stated that this item is not applicable. The applicant stated that WCGS has no heat exchangers in the condensate or blowdown systems, and no heat exchangers with a heat transfer intended function in the AFW system that are within the scope of license renewal. The staff reviewed plant basis documents and interviewed the technical personnel to verify that WCGS does not has these components within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

(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. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage reduction of heat transfer due to fouling for carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

SRP-LR Section 3.4.2.2.4 states that reduction of heat transfer due to fouling may occur in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP monitors and controls lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that fouling does not occur. The GALL Report recommends further evaluation of programs to verify the effectiveness of lube oil chemistry control programs. A one-time inspection of 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.

In LRA Table 3.4.1, item 10, the applicant addresses reduction of heat transfer due to fouling in steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The staff noted that the applicant utilizes the Lubricating Oil Analysis Program to manage reduction of heat transfer aging effect. The One-Time Inspection Program is used to verify the effectiveness of the lube oil chemistry control by performing an inspection of selected components at susceptible locations, as recommended by the GALL Report.

The staff reviewed the Lubricating Oil Analysis Program and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage reduction of heat transfer due in fouling for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.4 criteria. For those line items that apply to LRA Section 3.4.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.5 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 MIC in steel piping and components and tanks exposed to soil. The applicant stated that the Buried Piping and Tanks Inspection Program will manage this aging effect in carbon steel external surfaces of buried components. Buried steel piping at WCGS is coated and/or wrapped in accordance with industry standards. A review of plant-specific operating history indicated one case of a pin hole leak failure of a buried fire protection system piping that is within the scope of license renewal. The failure resulted from a loss of material due to external pitting corrosion underneath a holiday (discontinuity) in the protective coating, which was subsequently weld repaired. In addition, the applicant stated that WCGS does not have any documented below grade aggressive environment conditions, and that although all buried piping within the scope of license renewal is protected by the cathodic protection system, no credit is taken for this for aging management. Based on the above, the applicant concluded that application of the wrapping and/or coating, and the programmatic inspection of their condition will be adequate to manage loss of material due to external corrosion.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel (with or without coating or wrapping) piping, piping components, piping elements, and tanks exposed to soil. The buried piping and tanks inspection program relies on industry practice, frequency of pipe excavation, and operating experience to manage the effects of loss of material from general, pitting, and crevice corrosion, and MIC. The effectiveness of the buried piping and tanks inspection program should be verified to evaluate an applicant's inspection frequency and

operating experience with buried components to ensure that loss of material does not occur.

In LRA Table 3.4.1, item 11, the applicant addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in buried steel piping, piping components, piping elements, and tanks (i.e., with or without coating or wrapping) exposed to soil. The staff reviewed the applicant's new Buried Piping and Tanks Inspection Program and its plant operating experience with buried piping. The staff noted that all the buried piping that is within the scope of license renewal is coated and/or wrapped, and protected by the cathodic protection system. The new Buried Piping and Tanks Inspection Program will be implemented within the 10-year period before entering the period of extended operation, during which time an opportunistic or planned inspection will be performed. Upon entering the period of extended operation, the program will require a planned inspection within ten years unless an opportunistic inspection has occurred.

The staff's evaluation of the Buried Piping and Tanks Inspection Program is documented in SER Section 3.0.3.1.4. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion (MIC) in buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil.

(2) LRA Section 3.4.2.2.5 addresses loss of material due to general, pitting, crevice, and MIC in steel heat exchanger components exposed to lubricating oil. The applicant stated that the Lubricating Oil Analysis and the One-Time Inspection Programs will manage this aging effect in carbon steel components exposed to lubricating oil. The one-time inspection will include selected components at susceptible locations where contaminants such as water could accumulate.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting, and crevice corrosion, and MIC may occur in steel heat exchanger components exposed to lubricating oil. The existing AMP periodically samples and analyzes lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment not conducive to corrosion. However, control of lube oil contaminants may not always be fully effective in precluding corrosion; therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion does not occur. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of 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 LRA Table 3.4.1, item 12, the applicant addresses loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in steel heat exchanger components exposed to lubricating oil. The staff noted that the applicant utilizes the Lubricating Oil Analysis Program to manage loss of material. The staff finds that the One-Time Inspection Program will be used to verify the effectiveness of the lube oil

chemistry control by performing an inspection of selected components at susceptible locations, as recommended by the GALL Report.

The staff reviewed the Lubricating Oil Analysis Program, and finds that it maintains lubricating oil contaminants within acceptable limits. Monitoring and trending of lubricating oil analysis results identifies component aging prior to the loss of the component's intended function. The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Lubricating Oil Analysis and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.16 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion in steel heat exchanger components exposed to lubricating oil.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.5 criteria. For those line items that apply to LRA Section 3.4.2.2.5, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.6 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. The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage this aging effect in stainless steel components exposed to secondary water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate (e.g., stagnant flow locations).

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.

In LRA Table 3.4.1, item 14, the applicant addresses cracking due to SCC in stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water with a temperature grater than 140 °F. The staff noted that the applicant utilizes the Water Chemistry Program to manage SCC. The One-Time Inspection Program will be used to verify the effectiveness of water chemistry by performing an inspection of selected components at susceptible locations, as recommended by the GALL Report.

The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Water Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage cracking due to SCC in stainless steel piping, piping components, and piping elements; tanks; and heat exchanger components exposed to treated water with a temperature greater than 140 °F.

In LRA Table 3.4.1, item 13, the applicant stated that this item is not applicable to WCGS because this item only applies to a BWR. The staff finds that this item applies to BWR systems and; therefore, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.6 criteria. For those line items that apply to LRA Section 3.4.2.2.6, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.7 Loss of Material Due to Pitting and Crevice Corrosion

The staff reviewed LRA Section 3.4.2.2.7 against the 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 in stainless steel, aluminum, and copper alloy piping and components, and stainless steel tanks and heat exchangers exposed to treated water.

    The applicant stated that the Water Chemistry and the One-Time Inspection Programs will manage this aging effect in stainless steel components exposed to secondary water. The one-time inspection will include selected components at susceptible locations where contaminants could accumulate such as stagnant flow locations and tank bottoms.

    SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements, and in stainless steel tanks and heat exchanger components exposed to treated water. The existing AMP monitors and controls water chemistry to manage the effects of loss of material due to pitting and crevice corrosion.

However, control of water chemistry may not preclude corrosion at locations with stagnant flow conditions; therefore, the GALL Report recommends that the effectiveness of water chemistry programs should be verified to ensure that corrosion does not occur. A one-time inspection of 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 noted that in LRA Table 3.4.1, item 3.4.1.15, the applicant stated that this item is not applicable. The applicant stated that WCGS has no aluminum or copper alloy components in the steam turbine, FW, condensate, blowdown, or AFW systems that are within the scope of license renewal. The staff reviewed plant basis documents and interviewed the technical personnel to confirm that WCGS has no aluminum or copper alloy components in the steam turbine, FW, condensate, blowdown, or AFW systems within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

In LRA Table 3.4.1, item 16, the applicant addresses loss of material due to general, pitting, and crevice corrosion in stainless steel piping, piping components, and piping elements, and in stainless steel tanks and heat exchanger components exposed to treated water. The staff noted that the applicant utilizes the Water Chemistry Program to manage loss of material. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry control by performing an inspection of selected components at susceptible locations, as recommended by the GALL Report.

The staff reviewed the One-Time Inspection Program, which is a new program that, when implemented, will be consistent with the GALL Report. The staff's evaluation of the Water Chemistry and the One-Time Inspection Programs is documented in SER Sections 3.0.3.2.2 and 3.0.3.1.3, respectively. The staff finds that these programs include activities that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion in stainless steel piping, piping components, and piping elements, and in stainless steel tanks and heat exchanger components exposed to treated water.

(2) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion in stainless steel piping and components exposed to soil. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel components exposed to soil in the condensate or AFW system that are within the scope of license renewal.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion could occur for 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 this aging effect is adequately managed.

In LRA Table 3.4.1, item 17, the applicant stated that this item is not applicable. The applicant stated that WCGS has no stainless steel components exposed to soil in the condensate or AFW system that are within the scope of license renewal. The staff reviewed plant basis documents and interviewed the technical personnel to verify that

WCGS does not has these components within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

(3) LRA Section 3.4.2.2.7 addresses loss of material due to pitting and crevice corrosion in copper alloy piping and components exposed to lubricating oil. The applicant stated that this aging effect is not applicable because WCGS does not have copper alloy components exposed to lubricating oil in the main steam, main turbine, FW, condensate, steam generator blowdown, or AFW systems that are within the scope of license renewal.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion may occur in copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing AMP 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 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 the component's intended function will be maintained during the period of extended operation.

In LRA Table 3.4.1, item 18, the applicant stated that this item is not applicable. The applicant stated that WCGS has no copper alloy components exposed to lube oil in the steam turbine, FW, condensate, or AFW systems that are within the scope of license renewal. The staff reviewed plant basis documents and interviewed the technical personnel to verify that WCGS does not has these components (copper alloy components exposed to lube oil in the steam turbine). Therefore, these are not applicable to be within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.4.2.2.7 criteria. For those line items that apply to LRA Section 3.4.2.2.7, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.8 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 MIC. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel components exposed to lube oil in the steam turbine, FW, condensate, or AFW systems that are within the scope of license renewal.

SRP-LR Section 3.4.2.2.8 states that loss of material due to pitting and crevice corrosion, and MIC may occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil.

In LRA Table 3.4.1, item 19, the applicant stated that this line item is not applicable. The applicant stated that WCGS has no stainless steel components exposed to lubricating oil in the steam turbine, FW, condensate, or AFW systems that are within the scope of license renewal. The staff reviewed plant basis documents and interviewed the technical personnel to verify that WCGS does not has these components within the scope of license renewal. The staff finds that this item is not applicable to WCGS.

Based on its review and confirmation above, the staff concludes that the applicant meets SRP-LR Section 3.4.2.2.8 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.9 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 loss of material due to general, pitting, crevice, and galvanic corrosion. The applicant stated that this aging effect is not applicable because WCGS is a PWR.

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 staff noted that this item applies to BWR systems and; therefore, is not applicable because WCGS is a PWR. On this basis, the staff finds that this aging effect is not applicable to this component type.

Based on its review and confirmation above, the staff concludes that the applicant meets SRP-LR Section 3.4.2.2.9 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2.10 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 3.4.2-6, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.4.2-1 through 3.4.2-6, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information about how it will manage the aging effects. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

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 Steam and Power Conversion System - Summary of Aging Management Evaluation - Main Turbine System – 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 turbine system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.4.2-1 are consistent with 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 Steam and Power Conversion System - Summary of Aging Management Evaluation - Main Steam System – LRA Table 3.4.2-2

The staff reviewed LRA Table 3.4.2-2, which summarizes the results of AMR evaluations for the main steam system component groups.

In LRA Table 3.4.2-2, the applicant applied Note J for insulation in the main steam system. The insulation is calcium silicate with aluminum sheathing and is exposed to the indoor air environment. The applicant did not identify an aging effect requiring management for these material and environment combinations.

During the audit, the staff requested that the applicant justify why an aging effect requiring management was not considered for the insulation.

In its response, the applicant stated that the subject insulation is located indoors and is exposed to a non-aggressive indoor air environment. The staff finds that the GALL Report states that no aging effects are applicable to aluminum piping components that are exposed to indoor air environment. The staff requested that the applicant explain why they did not specify the GALL Report item for the material and environment combination.

By letter dated August 31, 2007, the applicant amended the LRA to include GALL Report, item V.F-2, Table 1 Item 3.2.1.50, and Note C for aluminum jacketing in plant indoor air. The staff finds that this item is now consistent with the GALL Report; therefore, the applicant's response is acceptable.

On the basis of its review of the current industry research and operating experience, the staff concludes that, since the insulation that is within the scope of license renewal is covered by aluminum sheathing and is not directly exposed to the indoor air, the aging of the insulation will not be a concern 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).

3.4.2.3.3 Steam and Power Conversion System - Summary of Aging Management Evaluation - Feedwater System – LRA Table 3.4.2-3

The staff reviewed LRA Table 3.4.2-3, which summarizes the results of AMR evaluations for the FW system component groups.

In LRA Table 3.4.2-3, the applicant applied Note J for insulation in the FW system. The insulation is aluminum and calcium silicate and is exposed to the indoor air environment. The applicant did not identify an aging effect requiring management for these material and environment combinations. During the site audit, the staff requested that the applicant justify why an aging effect requiring management was not considered for the insulation.

In its response, the applicant stated that the subject insulation is located indoors and is exposed to a non-aggressive indoor air environment. The staff finds that the GALL Report states that no aging effects are applicable to aluminum piping components that are exposed to indoor air environment. The staff requested that the applicant explain why a GALL Report item for the material and environment combination was not identified.

By letter dated August 31, 2007, the applicant amended the LRA to include GALL Report item V.F-2, Table 1 Item 3.2.1.50, and Note C for aluminum jacketing in plant indoor air. Since this line item is now consistent with the GALL Report, the staff finds it acceptable.

On the basis of its review of the current industry research and operating experience, the staff concludes that, since the insulation is not directly exposed to the indoor air, the aging will not be a concern 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).

3.4.2.3.4 Steam and Power Conversion System - Summary of Aging Management Evaluation - Condensate System – LRA Table 3.4.2-4

The staff reviewed LRA Table 3.4.2-4, which summarizes the results of AMR evaluations for the condensate system component groups.

In LRA Table 3.4.2-4, the applicant applied Note G for the external surface of stainless steel tank in the condensate system. The tank exterior is exposed to atmosphere weather conditions. The applicant did not identify an aging effect requiring management for this tank under the stated environment condition.

During the audit, the staff requested that the applicant clarify if the subject tank is located above ground or partially buried. The staff also requested that the applicant justify why an aging effect requiring management was not considered for the tank exterior.

In its response, the applicant clarified that the subject tank is the CST, which is made of stainless steel and located above ground on a concrete foundation. The applicant also stated that it applied note G to the tank because the atmosphere weather environment for stainless steel is not addressed in the GALL Report. The applicant's response also stated that the plant outdoor environment at WCGS is not subject to industrial air pollution or saline environment and that the stainless steel tank is not exposed to aggressive chemical species.

The staff noted that alternate wetting and drying resulting from rain has shown a tendency to wash the exterior surface material rather than concentrate contaminants. The SCC in stainless steel, which is considered plausible in wetted corrosive environments with a temperature greater than 140 °F, will not occur in the outside air environment. Also, in the absence of the corrosive contaminants on the exterior surface, the tank surface should not be susceptible to loss of material.

The staff also noted that the loss of material in the tank interior exposed to secondary water is adequately controlled by the Water Chemistry and One-Time Inspection Programs. Based on its review, the staff concludes that for the exterior surface of the stainless steel tank exposed to outdoor atmosphere weather, there is no aging effect requiring management because the tank is neither susceptible to surface corrosion nor to SCC given the absence of corrosive contaminants and the lack of wetted corrosive environment with temperature greater than 140 °F.

By letter dated August 31, 2007, the applicant amended the LRA to add the stainless steel rupture disc component in an exterior environment of atmosphere weather with no aging effects and aging management required. The applicant applied note G to this new line item.

On the basis that this tank has the same material and environment combination, the staff finds that there is no aging effect requiring management because the rupture disc is neither susceptible to surface corrosion nor to SCC given the absence of any corrosive contaminants and the lack of wetted corrosive environment with temperature greater than 140 °F.

In LRA Table 3.4.2-4, the applicant applied note H for steel closure bolting in the condensate system. This closure bolting is carbon steel and is exposed to outdoor atmosphere weather conditions. The applicant proposed to manage loss of preload in these components by using the Bolting Integrity Program.

During the audit, the staff requested that the applicant explain where this closure bolts are located.

In its response, the applicant clarified that the examples of such closure bolting are carbon steel bolts or studs installed on valves and flanges exposed to atmosphere weather. The staff noted that the GALL Report does not have a loss of preload line item for steel closure bolting exposed to an atmosphere weather environment. The staff noted that the Bolting Integrity Program requires that the bolting installation plant procedures control joint assembly and pre-load. This includes pre-assembly inspection and cleaning requirements, use of specific bolt torque patterns, use of increased torque application through multiple passes, and verification of the gasket compression. The staff also noted that post-bolting inspections include verification of contact between the fastener and flange, and proper flange alignment. Additionally, the same program is used to manage loss of pre-load for closure bolting exposed to environments discussed in the GALL Report. The staff's evaluation of the Bolting Integrity Program is documented in SER Section 3.0.3.2.7.

On the basis of its review of the applicant's plant-specific and industry operating experience, the staff finds that the aging effect of loss of pre-load in carbon steel closure bolting exposed to an environment of outdoor atmosphere weather conditions will be adequately managed using 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).

3.4.2.3.5 Steam and Power Conversion System - Summary of Aging Management Evaluation - Steam Generator Blowdown System – LRA Table 3.4.2-5

The staff reviewed LRA Table 3.4.2-5, which summarizes the results of AMR evaluations for the steam generator blowdown system component groups.

In LRA Table 3.4.2-5, the applicant applied Note J for insulation in the steam generator blowdown system. This insulation is calcium silicate or foamglass with aluminum or stainless steel sheathing and is exposed to an environment of indoor air. In the LRA, the applicant did not identify an aging effect requiring management for these material and environment combinations.

During the audit, the staff requested that the applicant justify why an aging effect requiring management was not considered for the insulation.

In its response, the applicant stated that the subject insulation is located indoors and is exposed to a non-aggressive indoor air environment. The staff finds that the GALL Report states that no aging effects are applicable to aluminum or stainless steel piping components that are exposed to an indoor air environment. The staff requested that the applicant explain why a GALL Report item was not specified for this material and environment combination.

By letter dated August 31, 2007, the applicant amended the LRA to add the component type of aluminum material insulation, referencing GALL Report, item V.F-2, and Note C. By letter dated October 11, 2007, the applicant amended the LRA to add the component type of insulation made of stainless steel, referencing GALL Report, item VIII.I-10, and Note C. Since these line items are now consistent with the GALL Report, the staff finds that the applicant's response is acceptable.

On the basis of its review of the current industry research and operating experience, the staff concludes that, because the insulation that is within the scope of license renewal is covered by aluminum or stainless steel sheathing and is not directly exposed to the indoor air, the aging of the insulation will not be a concern 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).

3.4.2.3.6 Steam and Power Conversion System - Summary of Aging Management Evaluation - Auxiliary Feedwater System – LRA Table 3.4.2-6

The staff reviewed LRA Table 3.4.2-6, which summarizes the results of AMR evaluations for the AFW system component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.4.2-6 are consistent with 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 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).

3.5 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:

- reactor building
- control building
- diesel generator building

- turbine building
- auxiliary building
- radwaste building
- emergency fuel oil tank vaults
- essential service water electrical duct banks and manways
- communications corridor
- transmission towers
- essential service water access vaults
- fuel building
- essential service water pumphouse building
- circulating water screenhouse
- ultimate heat sink
- essential service water discharge structure
- main dam and auxiliary spillway
- essential service water valve house
- refueling water storage tank foundation and valve house
- condensate storage tank foundation and valve house
- concrete support structures for station transformers
- supports

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 in Chapters II and III of NUREG-1801 for Containments, Structures, and Component Supports," 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 onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.5.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.5.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.5.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.5.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

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	ASME Code Section XI, Subsection IWL (B2.1.28)	Consistent with GALL Report (See SER Section 3.5.2.2.1.1)

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
Concrete elements; All (3.5.1-2)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.1.2)
Concrete elements: foundation, subfoundation (3.5.1-3)	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program If a de-watering system is relied upon to control erosion of cement from porous concrete subfoundations, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Not applicable	Not applicable to WCGS (See SER Section 3.5.2.2.1.2)
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 WCGS (See SER Section 3.5.2.2.1.3)

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
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 (See SER Section 3.5.2.2. 1.4)
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	ASME Code Section XI, Subsection IWE (B2.1.27) and 10 CFR 50, Appendix J (B2.1.30)	Consistent with GALL Report (See SER Section 3.5.2.2. 1.4)
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	Loss of prestress is a TLAA (See SER Section 3.5.2.2. 1.5)
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. 1.6)
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	Not applicable	Not applicable to PWRs (See SER Section 3.5.2.2. 1.6)

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 penetration sleeves, penetration bellows, dissimilar metal welds (3.5.1-10)	Cracking due to SCC	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 WCGS (See SER Section 3.5.2.2.1.7)
Stainless steel vent line bellows, (3.5.1-11)	Cracking due to SCC	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 (See SER Section 3.5.2.2.1.7)
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	Not applicable to WCGS (See SER Section 3.5.2.2.1.8)
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 (See SER Section 3.5.2.2.1.8)
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	ASME Code Section XI, Subsection IWL (B2.1.28)	Consistent with GALL Report (See SER Section 3.5.2.2.1.9)

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
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	ASME Code Section XI, Subsection IWL (B2.1.28)	Consistent with GALL Report (See SER Section 3.5.2.2.1.10)
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	ASME Code Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	Consistent with GALL Report
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 (B2.1.30)	Consistent with GALL Report
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	ASME Code Section XI, Subsection IWE (B2.1.27) and 10 CFR Part 50, Appendix J (B2.1.30)	Consistent with GALL Report
Steel elements: stainless steel suppression chamber shell (inner surface) (3.5.1-19)	Cracking due to SCC	ISI (IWE) and 10 CFR Part 50, Appendix J	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 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	ASME Code Section XI, Subsection IWL (B2.1.28)	Consistent with GALL Report
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)

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: 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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.1)
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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.2)
Groups 1-3, 5-9: All (3.5.1-28)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.2)
Groups 1-3, 5-9: foundation (3.5.1-29)	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the applicant is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes	Not applicable	Not applicable to WCGS (See SER Section 3.5.2.2.2.1)

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 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 WCGS (See SER Section 3.5.2.2.2.1)
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.2)
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.2)
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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.3)

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
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	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Consistent with GALL Report (See SER Section 3.5.2.2.2.4)
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	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Consistent with GALL Report (See SER Section 3.5.2.2.2.4)

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
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	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Consistent with GALL Report (See SER Section 3.5.2.2.2.4)
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	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Consistent with GALL Report (See SER Section 3.5.2.2.2.4)
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	Not applicable	Not applicable to WCGS (See SER Section 3.5.2.2.2.5)
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.6)

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
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 (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.2.2.6)
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 WCGS (See SER Section 3.5.2.2.2.6)
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	TLAA	Consistent with GALL Report (See SER Section 3.5.2.2.2.7)
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	Fire Protection (B2.1.12) and Masonry Wall Program (B2.1.31)	Consistent with GALL Report (See SER Section 3.5.2.1.2)
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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report
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	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Consistent with GALL Report (See SER Section 3.5.2.1.4)

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
Group 5: fuel pool liners (3.5.1-46)	Cracking due to SCC; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No	Water Chemistry (B2.1.2)	Consistent with GALL Report
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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report (See SER Section 3.5.2.1.3)
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	Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (B2.1.33)	Consistent with GALL Report
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 (B2.1.32)	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
Group B1.1: high strength low-alloy bolts (3.5.1-51)	Cracking due to SCC; loss of material due to general corrosion	Bolting Integrity	No	Bolting Integrity (B2.1.7)	Consistent with GALL Report
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	Structures Monitoring Program (B2.1.32)	Consistent with GALL Report
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	ASME Code Section XI, Subsection IWF (B2.1.29)	Consistent with GALL Report
Groups B1.1, B1.2, and B1.3: constant and variable load spring hangers; guides; stops; (3.5.1-54)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	ASME Code Section XI, Subsection IWF (B2.1.29)	Consistent with GALL Report
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 (B2.1.4)	Consistent with GALL Report
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	Not applicable	Not applicable to WCGS

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: 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 WCGS
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
Stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-59)	None	None	No	None	Consistent with GALL Report

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 supports 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 supports components:

- Water Chemistry
- Boric Acid Corrosion
- Bolting Integrity

- Fire Protection
- ASME Code Section XI, Subsection IWE
- ASME Code Section XI, Subsection IWL
- ASME Code Section XI, Subsection IWF
- 10 CFR 50, Appendix J
- Masonry Wall
- Structures Monitoring
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants

LRA Tables 3.5.2-1 through 3.5.2-22 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 the GALL Report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also 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 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 verified whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA, 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, the applicant identified items 3.5.1-56 and 3.5.1-57 as not applicable because the component, material, and environment combination does not exist at WCGS. The staff reviewed the LRA and the applicant's supporting documents, and confirmed that this combination does not exist at WCGS. Because WCGS does not have the component, material, and environment combination for these items, the staff finds that these AMRs are not applicable.

3.5.2.1.2 Cracking due to Restraint Shrinkage, Creep, and Aggressive Environment

In LRA Table 3.5.1, item 3.5.1-43, the applicant stated that cracking due to restraint shrinkage, creep, and aggressive environment is managed by the Fire Protection Program. For this item, the applicant credited note E to the associated AMR result lines in LRA table 3.5.2. However, the staff noted that the GALL Report recommends that concrete masonry be inspected by the Masonry Wall Program.

The staff reviewed the AMR result line items that reference note E and determined that the component type, material, environment, and aging effect are consistent with the recommendations in the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.S5, "Masonry Wall Program," the applicant has proposed using the Fire Protection Program.

During the audit, the applicant stated that the AMR result line items that reference LRA table 3.5.1, item 3.5.1-43 are listed only as fire barriers that are within the scope of license renewal pursuant to 10 CFR 54.4(a)(2), and are not in the masonry wall system and; therefore, the Fire Protection Program was credited.

The staff noted that the Fire Protection Program performs visual inspections on a periodic basis to manage cracking due to restraint shrinkage, creep, and aggressive environments. On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the Fire Protection Program acceptable.

On the basis of its review of the applicant's AMR result and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effects management adequately, as recommended by the GALL Report.

3.5.2.1.3 Loss of Material Due to General, Pitting, and Crevice Corrosion

In LRA Table 3.5.1, item 3.5.1-47, the applicant stated that loss of material due to general, pitting, and crevice corrosion is managed by the Structures Monitoring Program. The applicant applied note E to the AMR result lines referencing item 3.5.1-47.

The staff reviewed the AMR results lines referencing note E and determined that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that where the GALL Report recommends AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," the applicant proposed using the Structures Monitoring Program. The staff finds that the AMR result line items that reference item 3.5.1-47, are metal structural members that are part of the WCGS water control structure, which are within the scope of the Structures Monitoring Program and not in the Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program. The staff finds that the Structures Monitoring Program performs visual inspections to manage loss of material due to general, pitting, and crevice corrosion. On the basis that periodic visual inspections are performed, the staff finds the applicant's use of the Structures Monitoring Program acceptable.

On the basis of its review of the AMR result lines and the recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect management adequately, as recommended by the GALL Report.

3.5.2.1.4 Loss of Material Due to Abrasion and Cavitation

In LRA Table 3.5.1, item 3.5.1-45, the applicant stated that loss of material due to abrasion and cavitation is managed by the Structures Monitoring Program. The applicant applied note E to the AMR result lines referencing item 3.5.1-45.

The staff requested that the applicant explain why note E was used instead of note A, since LRA Tables 3.5.1 and 3.5.2 are both crediting the Structures Monitoring Program.

By letter dated August 31, 2007, the applicant amended LRA Table 3.5.1, item 3.5.1-45, to read:"Inspection of Water-Control Structures(B2.1.33)." This amendment to the LRA will correctly align with the SRP. The applicant also indicated that WCGS inspects the submerged portions of the circulating water screen house as part of the Structures Monitoring Program. Therefore, for this component, the Structures Monitoring Program is credited instead of the Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program.

The staff reviewed the AMR results for this line item and determined that the component type, material, environment, and aging effect are consistent with the GALL Report. However, where the GALL Report recommends AMP XI.S7, Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants, the applicant has proposed using the Structures Monitoring Program because the submerged portions of the circulating water screen house is part of the Structures Monitoring Program. The staff finds that the Structures Monitoring Program performs visual inspections to manage loss of material due to abrasion and cavitation. On the basis of its review, the staff finds the applicant's use of the Structures Monitoring Program acceptable.

On the basis of its review of the AMR result line items and recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect management adequately, as recommended by the GALL Report.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.5.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the containments, structures and component supports components and provides information concerning how it will manage the following aging effects and related QA:

(1) PWR 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 GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.5.2.2. The staff's review of the applicant's further evaluation follows.

3.5.2.2.1 PWR Containments

The staff reviewed LRA Section 3.5.2.2.1 against SRP-LR Section 3.5.2.2.1 criteria, which address several areas of review:

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 aging of inaccessible concrete areas. The applicant stated that reinforced concrete structures at WCGS 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. The applicant stated that crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Monthly tests conducted from June 2005 to May 2006 showed that the WCGS groundwater and soil have pH values between 7.0 and 8.7, which are above the recommended minimum pH of 5.5. These tests also showed that chloride solutions range from 5.0 to 41.2 ppm, and sulfate solutions range from 30 to 717 ppm. These results compare favorably to the recommended limits of less than 500 ppm and less than 1500 ppm, respectively. The applicant stated that WCGS is located in a geologically and environmentally stable area. In addition, it stated that groundwater chemistry is not expected to change significantly in the future and that further evaluation for the effects of corrosion of embedded steel and aggressive chemical attack is not required.

SRP-LR Section 3.5.2.2.1.1 states that increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel may occur in inaccessible areas of PWR and BWR concrete and steel containments. The existing program relies on ASME Code Section XI, Subsection IWL to manage these aging effects; however, the GALL Report recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas in aggressive environments.

The staff noted that the listed possible aging effects apply to concrete elements of PWR containments and concrete BWR containments. The applicant proposed to manage these aging effects using the ASME Code Section XI, Subsection IWL Program. The staff's evaluation of the ASME Code Section XI, Subsection IWL Program is documented in SER Section 3.0.3.2.18. The applicant stated that WCGS is located in a geologically and environmentally stable area. In addition, it stated that groundwater chemistry is not expected to change significantly in the future and that further evaluation for the effects of corrosion of embedded steel and aggressive chemical attack is not required. The staff requested that the applicant clarify if the Structures Monitoring Program will continue to perform the groundwater monitoring.

In its letter dated July 26, 2007, the applicant committed (Commitment No. 17) to monitor groundwater for pH, sulfates, and chlorides. Two samples of groundwater will be tested every five years.

On the basis that periodic groundwater monitoring will be performed to ensure that the chemistry has not changed, the staff finds the applicant's response acceptable. The staff finds that the ASME Code Section XI, Subsection IWL Program includes activities that are consistent with the recommendations in the GALL Report, and are adequate to manage aging of accessible and inaccessible areas due to aggressive chemical attack and corrosion of embedded steel.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 and distortion due to increased stress levels from settlement, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations. The applicant stated that competent foundation materials were found to be present at WCGS for establishing conservative design and construction criteria for support of the facilities. Major structures are founded on soil, undisturbed and/or compacted fill, over competent bedrock. USAR Table 2.5-54b shows that settlements of all major structures, measured in November 1983, are below the allowable values. The applicant stated that no permanent de-watering system has been constructed at WCGS and that further evaluation for the effects of settlement is not required. In addition, it stated that there are no porous concrete subfoundations in WCGS and that this aging effect is not applicable and further evaluation is not required.

SRP-LR Section 3.5.2.2.1.2 states that cracks and distortion due to increased stress levels from settlement may occur in PWR and BWR concrete and steel containments. Also, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations may occur in all types of PWR and BWR containments. The existing program relies on structures monitoring to manage these aging effects. Some plants may rely on a de-watering system to lower the site groundwater level. If the plant's CLB credits a de-watering system, the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation. The GALL Report recommends no further evaluation if this activity is within the scope of the applicant's structures monitoring program.

The staff finds that cracking and distortion due to increased stress levels from settlement, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations (if not covered by the Structures Monitoring Program) are not plausible aging effects because these aging mechanisms do not exist.

The applicant stated that the aging effects due to settlement in the containment building foundation are not expected. It clarified that the containment building is founded on sound bedrock, which prevents significant settlement. In addition, there is no porous concrete subfoundation of concern below the containment building. However, the applicant conservatively elected to use the Structural 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 3.0.3.2.21. 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 program identified above, the staff concludes that the applicant's program meets 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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Reduction of Strength and Modulus of Concrete Structures Due to Elevated Temperature</u>.

The staff reviewed LRA Section 3.5.2.2.1.3 against the criteria in SRP-LR Section 3.5.2.2.1.3.

LRA Section 3.5.2.2.1.3 addresses reduction of strength and modulus of concrete structures due to elevated temperature. The applicant stated that this aging effect is not applicable because WCGS has no dome, wall, basemat, ring girder, buttresses, containment, or annulus concrete exposed to temperature above 150 °F for general areas, or 200 °F for local areas. The applicant stated that high energy line penetrations have been designed with flued heads to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete.

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 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. The GALL Report recommends further evaluation of plant-specific AMPs if any portion of the concrete containment components exceeds specified temperature limits (i.e., general area temperature greater than 60 °C (150 °F) and local area temperature greater than 93 °C (200 °F)).

The applicant stated that the aging effects due to elevated temperature are not expected at WCGS because the general area temperatures within the primary containment do not exceed 150 °F and local area temperatures do not exceed 200 °F. The staff finds that the reduction of strength and modulus for concrete structures due to elevated temperature is not plausible aging effects because this aging mechanism does not exist.

In addition, the staff finds that because the general area temperatures within the primary containment do not exceed 150 °F and local area temperatures do not exceed 200 °F, these aging effects are not applicable at WCGS.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.5.2.2.1.3 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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. The applicant stated that reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3 and 6 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. USAR Section 3.8 discusses the design requirements for each major structure.

The applicant stated that the Structures Monitoring Program will identify and manage any cracks in the concrete or degradation of the moisture barrier that could potentially provide a pathway for water to reach inaccessible portions of the steel containment liner. In addition, procedural controls will ensure that borated water spills are not common, and that, if detected, they will be cleaned up in a timely manner. Therefore, the applicant concluded that further evaluation for corrosion in inaccessible areas of the steel containment liner is not required.

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.

The staff noted that loss of material due to general pitting and crevice corrosion in the steel elements listed in table 3.5.1, item 3.5.1-5, could only occur in BWRs; therefore, is not applicable to WCGS. However, the staff noted that for loss of material due to general, pitting, and crevice corrosion of carbon steel for steel liner, liner anchors, and integral attachments, described in table 3.5.1, item 3.5.1-6, the applicant is crediting only the ASME Code Section XI, Subsection IWE Program. The staff's evaluation of the ASME Code Section XI, Subsection IWE Program is documented in SER Section 3.0.3.2.17. The applicant's containment ISI encompasses the ASME Code Section XI, Subsection IWE Program requirements for managing the loss of material for the primary containment and its integral attachments.

Because the applicant's containment ISI includes the same requirements for inspection and detection of loss of material for the primary containment and its integral attachments as the ASME Code Section XI, Subsection IWE, the staff finds it to be acceptable AMP to manage loss of material of these components.

The staff noted that table 1, item 3.5.1-6, the LRA states that the Structures Monitoring Program is used to manage cracking. Item 3.5.1-6 references LRA Section 3.5.2.2.1.4. However, the discussion column of this item credits the ASME Code Section XI, Subsection IWE Program. The staff requested that the applicant explain why the Structures Monitoring Program was not credited.

By letter dated August 31, 2007, the applicant amended LRA Section 3.5.2.2.1.4 to note that the WCGS program relies on ASME Code Section XI, Subsection IWE Program, and 10 CFR 50, Appendix J, to manage loss of material. LRA Table 3.5.2-1 was amended to credit the 10 CFR 50, Appendix J Program to manage the component type of liner containment exposed to an external plant indoor air. The applicant also stated that LRA Section 3.5.2.2.1.4 is intended to specifically address the conditions given in the GALL Report, item II.A1-11. These conditions, if satisfied, allow the presumption that, for inaccessible areas (i.e., embedded containment steel shell or liner), loss of material due to corrosion is not significant. Therefore, further evaluation for corrosion in inaccessible areas of the steel containment liner is not required. The concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner.

The staff finds that the Structures Monitoring Program will identify and manage any cracks in the concrete (or degradation of the moisture barrier) that could potentially provide a pathway for water to reach inaccessible portions of the steel containment liner. The staff reviewed the AMR results for this line item and determines that the component type, material, environment, and aging effect are consistent with the GALL Report. However, the staff noted that the GALL

Report recommends AMP XI.S1 "ASME Section XI, Subsection IWE Program" and AMP XI.S4 "10 CFR 50, Appendix J." The staff also noted that reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3 and 6 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. The staff noted that USAR Section 3.8 discusses the design requirements for each major structure. Therefore, the staff finds that further evaluation for corrosion in inaccessible areas of the steel containment liner is not required. The Structures Monitoring Program performs visual inspections to manage loss of material due to general, pitting and crevice corrosion. On the basis of its review, the staff finds the applicant's use of the Structures Monitoring Program acceptable.

Based on the program identified above, the staff concludes that the applicant's program meets 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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature.

The staff reviewed LRA Section 3.5.2.2.1.5 against the criteria in SRP-LR Section 3.5.2.2.1.5.

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.

Cumulative Fatigue Damage.

The staff reviewed LRA Section 3.5.2.2.1.6 against the criteria in SRP-LR Section 3.5.2.2.1.6

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 not applicable because WCGS does not have containment penetration sleeves with bellows with dissimilar metal welds.

SRP-LR Section 3.5.2.2.1.6 states that if included in the current licensing basis, fatigue analyses of suppression pool steel shells (including welded joints) and penetrations (including penetration sleeves, dissimilar metal welds, and penetration bellows) for all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers are TLAAs as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1).

The staff noted that this item applies to containment penetration sleeves with bellows with dissimilar metal welds that are within the scope of license renewal. The staff finds that WCGS does not have these components; therefore, this line is not applicable.

Cracking Due to Stress Corrosion Cracking.

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 SCC. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel penetration sleeves, penetration bellows, or dissimilar metal welds subject to SCC that are within the scope of license renewal. Therefore, the applicable GALL Report line items were not used.

SRP-LR Section 3.5.2.2.1.7 states that cracking due to SCC of stainless steel penetration sleeves, penetration bellows, and dissimilar metal welds may occur in all types of PWR and BWR containments. Cracking due to SCC also may occur in stainless steel vent line bellows for BWR containments. The existing program relies on ASME Code Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of additional appropriate examinations/evaluations implemented to detect these aging effects for stainless steel penetration sleeves, penetration bellows and dissimilar metal welds, and stainless steel vent line bellows.

The staff noted that this item applies to stainless steel penetration sleeves, penetration bellows, or dissimilar metal welds subject to SCC that are within the scope of license renewal. The staff finds that WCGS does not have these components; therefore, this line is not applicable.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.5.2.2.1.7 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Cyclic Loading.

The staff reviewed LRA Section 3.5.2.2.1.8 against the criteria in SRP-LR Section 3.5.2.2.1.8.

LRA Section 3.5.2.2.1.8 addresses cracking due to cyclic loading. The applicant stated that this aging effect is not applicable because WCGS does not have containment penetration sleeves with bellows with dissimilar metal welds.

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) could occur in all types of PWR and BWR containments and BWR vent header, vent line bellows, and downcomers. The existing program relies on ASME Code Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect; however, visual examination (VT-3) may not detect fine cracks. The GALL Report recommends further evaluation for detection of this aging effect.

The staff noted that this item applies to containment penetration sleeves with bellows with dissimilar metal welds that are within the scope of license renewal. The staff finds that WCGS does not have these components; therefore, this line is not applicable.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.5.2.2.1.8 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Loss of Material (Scaling, Cracking, and Spalling) Due to Freeze-Thaw.

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. The applicant stated that, as described in USAR Section 2.3.2.1.1, the average monthly temperatures at WCGS range from 80 °F in July and August to 29 °F in January, with extremes recorded as high as 117 °F and as low as -27 °F. Reinforced concrete structures at WCGS were designed, constructed, and inspected in accordance with 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. Therefore, the applicant concluded that further evaluation for the effects of freeze-thaw is not required. In addition, testing and petrographic examination, performed in accordance with ASTM C295, has demonstrated that the concrete aggregates at WCGS are non-reactive; therefore, further evaluation for the effects of reaction with aggregates is not required.

SRP-LR Section 3.5.2.2.1.9 states that loss of material (scaling, cracking, and spalling) due to freeze-thaw may occur in PWR and BWR concrete containments. The existing program relies on ASME Code Section XI, Subsection IWL to manage this aging effect. The GALL Report recommends further evaluation of this aging effect for plants located in moderate to severe weather conditions.

The staff confirmed that WCGS is located in an area with moderate weathering conditions; therefore, concrete does not exhibit degradation related to freeze-thaw. The staff's evaluation of the ASME Code Section XI, Subsection IWL Program is documented in SER Section 3.0.3.2.18. The staff finds that the ASME Code Section XI, Subsection IWL Program provides inspection frequencies, sample size, and method of inspection for reinforced concrete and post-tensioning systems to ensure that the aging effects are adequately managed. The implementation of this program provides reasonable assurance that the component's intended functions will be maintained within the CLB during the period of extended operation. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and is adequate to manage loss of material due to freeze-thaw.

Based its review and confirmation on the program identified above, the staff concludes that the applicant's program meets SRP-LR Section 3.5.2.2.1.9 criteria. For those line items that apply to LRA Section 3.5.2.2.1.9, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 increase in porosity and permeability due to leaching of calcium hydroxide. The applicant stated that testing and petrographic examination, performed in accordance with ASTM C295, has demonstrated that the concrete aggregates at WCGS are non-reactive; therefore, the applicant concluded that further evaluation for the effects of reaction with aggregates is not required.

In addition, the applicant stated that reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3 and 6 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. Therefore, the applicant concluded that further evaluation for the effects of leaching of calcium hydroxide is not required.

SRP-LR Section 3.5.2.2.1.10 states that cracking due to expansion and reaction with aggregate and increase in porosity and permeability due to leaching of calcium hydroxide may occur in concrete elements of PWR and BWR concrete and steel containments. The existing program relies on ASME Code Section XI, Subsection IWL to manage these aging effects. The GALL Report recommends further evaluation if concrete was not constructed in accordance with ACI 201.2R-77 recommendations.

During the audit, the applicant indicated that cracking due to expansion and reaction with aggregate and increase in porosity and permeability due to leaching of calcium hydroxide is not applicable to the WCGS containment. The staff noted that the GALL Report recommends programs consistent with GALL AMP XI.S2, "ASME Section XI, Subsection IWL." The staff's evaluation of the applicant's ASME Code Section XI, Subsection IWL Program is documented in SER Section 3.0.3.2.18. The staff finds that the ASME Code Section XI, Subsection IWL imposes requirements for inspection and detection of cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide. Because the applicant's existing ASME Code Section XI, Subsection IWL Program includes the same requirements for inspection and detection of cracking of material for the containment as the ASME Code Section XI, Subsection IWL, the staff finds it to be an acceptable AMP to manage cracking of the above components.

The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and is adequate to manage cracking due to expansion and reaction with aggregate and increase in porosity and permeability due to leaching of calcium hydroxide.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.1.10 criteria. For those line items that apply to LRA

Section 3.5.2.2.1.10, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

The staff reviewed LRA Section 3.5.2.2.2 against SRP-LR Section 3.5.2.2.2 criteria, which address several areas:

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 aging of structures not covered by the Structures Monitoring Program. The applicant stated that loss of material due to corrosion does not require further evaluation because the steel components are evaluated under the Structures Monitoring Program.

The applicant stated that reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3 and 6 percent, 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. Monthly tests conducted from June 2005 to May 2006 showed that the groundwater and soil at WCGS have pH values between 7.0 and 8.7, which are above the recommended minimum pH of 5.5. These tests also showed that chloride solutions range from 5.0 to 41.2 ppm, and sulfate solutions range from 30 to 717 ppm. These results compare favorably to the recommended limits of less than 500 ppm and less than 1500 ppm, respectively. The applicant stated that WCGS is located in a geologically and environmentally stable area. In addition, it stated that groundwater chemistry is not expected to change significantly in the future and that further evaluation for the effects of corrosion of embedded steel, aggressive chemical attack, and leaching of calcium hydroxide is not required.

The applicant stated that testing and petrographic examination, performed in accordance with ASTM C295, demonstrated that the concrete aggregates at WCGS are non-reactive and that further evaluation for the effects of reaction with aggregates is not required. The applicant also stated that, as described in USAR Section 2.3.2.1.1, the average monthly temperatures at WCGS range from 80 °F in July and August to 29 °F in January, with extremes recorded as high as 117 °F and as low as -27 °F. Reinforced concrete structures at WCGS were designed, constructed, and inspected in accordance with ACI and ASTM standards. The mixes were designed with entrained air content between 3 and 6 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes; therefore, further evaluation for the effects of freeze-thaw is not required.

The applicant stated that competent foundation materials were found to be present at WCGS for establishing conservative design and construction criteria for support of the facilities. Major structures are founded on soil, undisturbed and/or compacted fill, over competent bedrock. USAR Table 2.5-54b shows that settlements of all major structures, measured in November 1983, are below the allowable values. The applicant stated that no permanent de-watering system has been constructed at WCGS; therefore, further evaluation for the effects of settlement is not required. In addition, it stated that WCGS does not have porous concrete subfoundations and; therefore, this aging effect is not applicable and further evaluation is not required.

During normal plant operation, a thermal loading is generated on the primary shield wall around the reactor cavity in WCGS. An insulation and cooling system is provided on the inside face of the wall to reduce the severity of this loading by limiting the concrete temperatures to 150 °F except for the area directly below the seal ring support which is limited to 220 °F. An engineering evaluation was performed to ensure that this elevated temperature would not be detrimental to the ability of the concrete to perform its intended functions. High energy line penetrations have been designed with flued heads to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete. The applicant stated that accessible concrete components will be monitored by the Structures Monitoring Program to identify and manage any visible effects due to elevated temperatures.

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.

(1) LRA Section 3.5.2.2.2.1 addresses cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for groups 1-5, 7, and 9 structures. The applicant stated that the aging mechanisms associated with cracking, loss of bond, and loss of material (i.e., spalling, scaling) due to corrosion of embedded steel are applicable only to below-grade concrete and grout structures. The applicant stated that the below-grade environment at WCGS is not aggressive, and that the concrete is designed in accordance with specification ACI 318-71, "Building Code Requirements for Reinforced Concrete." The use of this specification results in having low permeability

and resistance to aggressive chemical solutions by providing a high-cement, low water-to-cement ratio (i.e., 0.50 or less), proper curing, and adequate air content (i.e., between 3 and 5 percent). The applicant stated that although specified water-to-cement ratio's fall outside the established range of 0.35 to 0.45, given all remaining parameters for durable concrete mix design, WCGS concrete meets the quality requirements of ACI to ensure acceptable concrete is obtained. Therefore, cracking, loss of bond, and loss of material (i.e., spalling, scaling) due to corrosion of embedded steel are not aging effects requiring management for Groups 1-5, 7, and 9 structures.

The staff determines that the cracking, loss of bond, and loss of material (i.e., spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, and 9 structures are not plausible aging effects because aggressive groundwater does not exist at WCGS. However, by a letter dated, July 26, 2007, the applicant committed (Commitment No. 17) to enhance the Structures Monitoring Program to perform periodic engineering evaluations (i.e., at least once every five years) of two groundwater samples to assess aggressiveness (i.e., pH less than 5.5, chloride greater than 500 ppm, and sulfate greater than 1500 ppm) of groundwater to concrete. The staff finds that the concrete at WCGS, designed in accordance with specification ACI 318-71, has a high-cement, low water-to-cement ratio, proper curing, and adequate air content between 3 and 6 percent. However, the applicant conservatively elected to include these aging effects for these groups within the Structures Monitoring Program.

The staff finds that cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel of accessible and inaccessible concrete for Groups 1-5 and 7-9 structures would be adequately managed by using the Structures Monitoring Program.

(2) LRA Section 3.5.2.2.2.1 addresses increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack for groups 1-5, 7, and 9 structures. The applicant stated that testing and petrographic examinations performed in accordance with ASTM C295 demonstrated that the concrete aggregates at WCGS are non-reactive and that further evaluation for the effects of reaction with aggregates is not required. Resistance to mild acid attack is enhanced by using a dense concrete with low permeability and low water-to-cement ratio of less than 0.50.

The staff finds that these groups of structures at WCGS use a dense low permeable concrete with an acceptable water-to-cement ratio, which provides an acceptable degree of protection against aggressive chemical attack. Water chemical analysis results confirm that the site groundwater is considered non-aggressive. However, by letter dated, July 26, 2007, the applicant committed (Commitment No. 17) to enhance the Structures Monitoring Program to perform periodic engineering evaluations (i.e., at least once every five years) of two groundwater samples to assess aggressiveness (i.e., pH less than 5.5, chloride greater than 500 ppm, and sulfate grater than 1500 ppm) of groundwater to concrete.

The applicant stated that its concrete is constructed in accordance with the recommendations in ACI 201.1R-92 for durability. It also stated that the below-grade environment is not aggressive. Therefore, increase in porosity and permeability cracking and loss of material (i.e., spalling, scaling) due to aggressive chemical attack are not aging effects requiring management for WCGS Groups 1-5, 7, and 9 concrete structures.

The staff determined, through discussions with the applicant's technical staff, that the increase in porosity and permeability, cracking, and loss of material (i.e., spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, and 9 structures are not plausible aging effects at WCGS due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.1R-92. However, the applicant conservatively elected to include the above aging effects for these groups within the Structures Monitoring Program. The staff finds that increase in porosity and permeability cracking and loss of material (i.e., spalling, scaling) due to aggressive chemical attack will be adequately managed by the Structures Monitoring Program.

(3) LRA Section 3.5.2.2.2.1 addresses loss of material due to corrosion for groups 1-5, 7, and 8 structures. The applicant stated that the Structures Monitoring Program will be used to manage the aging effects requiring management for Groups 1-5, 7, and 8 structures.

The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.21. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and is adequate to manage loss of material due to corrosion for Groups 1-5, 7, and 8 structures. The staff finds that loss of material due to corrosion is not a plausible aging effect at WCGS due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.1R-92. However, the applicant conservatively elected to include this aging effect for these groups within the Structures Monitoring Program. The staff finds that loss of material due to corrosion will be adequately managed by the Structures Monitoring Program.

(4) LRA Section 3.5.2.2.2.1 addresses loss of material (spalling, scaling) and cracking due to freeze-thaw for groups 1-3, 5, and 7-9 structures. The applicant stated that aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards.

The staff noted that the WCGS' structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water-to-cement ratios are within the limits provided in ACI 318-71, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw are not aging effects requiring management for Groups 1-3, 5, and 7-9 structures.

The staff determines that the loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, and 7-9 structures are not plausible aging effects at WCGS because the concrete was constructed in accordance with ACI and ASTM standards. However, the applicant conservatively elected to use the Structures Monitoring Program to monitor concrete for the aging effect of loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.21. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and is adequate to manage loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, and 7-9 structures.

(5) LRA Section 3.5.2.2.2.1 addresses cracking due to expansion and reaction with aggregates for groups 1-5 and 7-9 structures. The applicant stated that testing and petrographic examination, performed in accordance with ASTM C295, demonstrated that the concrete aggregates at WCGS are non-reactive and that further evaluation for the effects of reaction with aggregates is not required.

The staff determines that cracking due to expansion and reaction with aggregates for Groups 1-5 and 7-9 structures are not plausible aging effects at WCGS because the concrete was constructed in accordance with ACI and ASTM standards with a high-cement, low-water-to-cement ratio. However, the applicant conservatively elected to include these aging effects for these groups within the Structures Monitoring Program.

(6) LRA Section 3.5.2.2.2.1 addresses cracks and distortion due to increased stress levels from settlement for groups 1-3 and 5-9 Structures. The applicant stated that settlement is not a credible event for Groups 1-3 and 5-9 structures at WCGS because they are founded on bedrock. The applicant clarified that no permanent de-watering system has been constructed at WCGS. Therefore, further evaluation for the effects of settlement is not required.

The staff noted that in LRA Table 3.5.1, item 3.5.1-28, the applicant stated that cracks and distortion due to increased stress levels from settlement for the ESW discharge structure is managed by the Inspection of Water Control Structures Program. The applicant was asked to explain why the Inspection of Water Control Structures Program was indicated instead of the Structures Monitoring Program as recommended by the GALL Report. The applicant stated that the ESW discharge structure is normally submerged and is inspected by divers under a program that is based on RG 1.127.

By letter dated August 31, 2007, the applicant amended LRA Table 3.5.2.16 for concrete elements component that references Table 1, item 3.5.1-28, to credit the Structures Monitoring Program and to apply note A instead of note E. The applicant also deleted note 1 for the table.

The staff reviewed the AMR results for this line item and determines that the component type, material, environment, and aging effect are consistent with the recommendations of the GALL Report. The staff finds the applicant's use of the Structures Monitoring Program acceptable.

On the basis of its review of the applicant's response, the staff finds that the applicant appropriately addressed the aging effect management as recommended by the GALL Report.

The staff also determines that the cracks and distortion due to increased stress levels from settlement for Groups 1-3 and 5-9 structures are not plausible aging effects these aging mechanisms do not exist at WCGS. The applicant stated that the aging effects due to settlement are not expected at WCGS for Groups 1-3 and 5-9, Class 1, structures. The applicant clarified that the WCGS Class 1 structures are founded on sound bedrock or supported by steel pilings which prevent significant settlement. However, the applicant conservatively elected to use its Structures Monitoring Program to monitor the above-grade exposed concrete of Groups 1-3, 5, and 7-9 structures for the aging effect of cracking due to settlement.

(7) LRA Section 3.5.2.2.2.1 addresses reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for groups 1-3 and 5-9 structures. The applicant stated that the WCGS concrete was provided in accordance with ACI 318-71 requirements resulting in dense, well-cured, high-strength concrete with low-permeability. Structures are supported on bedrock and erosion of the subfoundation is not credible since the subfoundation also eliminates the possibility of loss of soil resulting in voids below the subgrade. The applicant stated that fluid leakage across the subfoundation is captured by circumferential drains and inspected for any material loss. Operating history has not identified any losses to date and; therefore, reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation are not aging effects requiring management for Groups 1-3 and 5-9 structures.

The staff determines that reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures are not plausible aging effects because these aging mechanisms do not exist.

The applicant stated that the aging effects of reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures are not applicable to WCGS because there are no porous concrete subfoundations of concern below these structures.

On the basis that WCGS does not have porous concrete subfoundations below these structures, the staff finds that these aging effects are not applicable to Groups 1-3 and 5-9 structures.

The staff determines that the applicant has included the above seven structures and aging effect combinations in its Structures Monitoring Program, and no further evaluation is required, in accordance with the GALL Report.

The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.21. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and that it is adequate to manage the aging effects as identified in items 1 through 7 above.

(8) LRA Section 3.5.2.2.2.1 addresses lockup due to wear for Lubrite® radial beam seats in BWR drywell and other sliding support surfaces. In LRA Table 3.5.1, item 3.5.1-30, the applicant stated that WCGS does not use sliding support surfaces for their equipment and piping supports. Therefore, wear-resistant material, the low frequency of movement, and the slow movement between sliding surfaces lockup due to wear is not an aging effect requiring management.

The staff determines that the lockup due to wear for sliding support surfaces is not a plausible aging effect due to wear-resistant material, the low frequency of movement, and the slow movement between sliding surfaces. On the basis that WCGS does not have sliding support surfaces for their equipment and piping supports that are within the scope of license renewal, the staff agrees that this line is not applicable.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Aging Management of Inaccessible Areas</u>.

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 aging management of inaccessible areas: freeze-thaw. The applicant stated that, as described in USAR Section 2.3.2.1.1, the average monthly temperatures at WCGS range from 80 °F in July and August to 29 °F in January, with extremes recorded as high as 117 °F and as low as -27 °F. Reinforced concrete structures at WCGS 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes; therefore, further evaluation for the effects of freeze-thaw is not required.

    SRP-LR Section 3.5.2.2.2.2 states that loss of material (spalling, scaling) and cracking due to freeze-thaw may occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas of these groups of structures for plants located in moderate to severe weather conditions.

    The staff determines that the loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, and 7-9 structures are not plausible aging effects at WCGS because the concrete was constructed in accordance with 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. The staff finds that further evaluation for the effects of freeze-thaw is not required.

(2) LRA Section 3.5.2.2.2.2 addresses aging management of inaccessible areas: reaction with aggregates. The applicant stated that testing and petrographic examination, performed in accordance with ASTM C295, demonstrated that the concrete aggregates at WCGS are non-reactive; therefore, further evaluation for the effects of reaction with aggregates is not required.

SRP-LR Section 3.5.2.2.2.2 states that cracking due to expansion and reaction with aggregates may occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures. The GALL Report recommends further evaluation of inaccessible areas of these groups of structures if concrete was not constructed in accordance with ACI 201.2R-77 recommendations.

The staff determines that the cracking due to expansion and reaction with aggregates for Groups 1-5 and 7-9 structures are not plausible aging effects at WCGS because the concrete was constructed in accordance with ACI and ASTM standards, which provide for a high-cement, low water-to-cement ratio. On this basis, the staff finds that further evaluation for the effects of reaction with aggregates is not required.

(3) LRA Section 3.5.2.2.2.2 addresses aging management of inaccessible areas: settlement and settlement due to erosion of porous concrete subfoundations. The applicant stated that competent foundation materials were found to be present at WCGS for establishing conservative design and construction criteria for support of the facilities. Major structures are founded on soil, undisturbed and/or compacted fill, over competent bedrock. USAR Table 2.5-54b shows that settlements of all major structures, measured in November 1983, are below the allowable values. The applicant stated that no permanent de-watering system has been constructed at WCGS; therefore, further evaluation for the effects of settlement is not required. In addition, it stated that there are no porous concrete subfoundations at WCGS; therefore, this aging effect is not applicable and further evaluation not required.

SRP-LR Section 3.5.2.2.2.2 states that cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations may occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The existing program relies on structures monitoring to manage these aging effects. Some plants may rely on de-watering systems to lower site groundwater level. If the plant's CLB credits a de-watering system, the GALL Report recommends verification of the system's continued functionality during the period of extended operation. The GALL Report recommends no further evaluation if this activity is included in the scope of the applicant's structures monitoring program.

The staff determines that reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 5, and 7-9 structures are not plausible aging effects because these aging mechanisms do not exist. The applicant stated that the aging effects of reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3 and 5-9 structures are not applicable to WCGS because there are no porous concrete subfoundations of concern below these structures. The staff finds that, for reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation for Groups 1-3, 5, and 7-9 structures, further evaluation is not required.

(4) LRA Section 3.5.2.2.2.2 addresses aging management of inaccessible areas: aggressive chemical attack and corrosion of embedded steel. The applicant stated that reinforced concrete structures at WCGS 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. The applicant stated that crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Monthly tests conducted from June 2005 to May 2006 showed that the groundwater and soil at WCGS have pH values between 7.0 and 8.7, which are above the recommended minimum pH of 5.5. These tests also showed that chloride solutions range from 5.0 to 41.2 ppm, and sulfate solutions range from 30 to 717 ppm. These results compare favorably to the recommended limits of less than 500 ppm and less than 1500 ppm, respectively. The applicant stated that WCGS is located in a geologically and environmentally stable area. It also stated that groundwater chemistry is not expected to change significantly in the future; therefore, further evaluation for the effects of aggressive chemical attack and corrosion of embedded steel is not required.

SRP-LR Section 3.5.2.2.2.2 states that increase in porosity and permeability, cracking, and loss of material (spalling, scaling) due to aggressive chemical attack and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel may occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects in inaccessible areas of these groups of structures in aggressive environments.

The staff determines that the cracking, loss of bond, and loss of material (i.e., spalling, scaling) due to corrosion of embedded steel for Groups 1-3, 5, and 7-9 structures are not plausible aging effects at WCGS due to the lack of aggressive groundwater. However, in the letter dated July 26, 2007 the applicant committed (Commitment No. 17) to monitor groundwater for pH, sulfates, and chlorides. Two samples of groundwater will be tested every five years. WCGS' concrete is designed in accordance with specification ACI 318-71 with a high-cement, low water-to-cement ratio, proper curing, and adequate air content between 3 and 6 percent. On the basis that periodic groundwater monitoring will be performed to ensure that the chemistry has not changed, the staff finds that for cracking, loss of bond, and loss of material (i.e., spalling, scaling) due to corrosion of embedded steel for Groups 1-3, 5, and 7-9 structures, further evaluation is not required.

(5) LRA Section 3.5.2.2.2.2 addresses aging management of inaccessible areas: leaching of calcium hydroxide. The applicant stated that reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3 and 6 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes; therefore, further evaluation for the effects of leaching of calcium hydroxide is not required.

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.

The staff determines that the loss of strength due to leaching of calcium hydroxide for Groups 1-3, 5, and 7-9 structures is are not plausible aging effects at WCGS because the concrete was constructed in accordance with 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes; therefore, further evaluation for the loss of strength due to leaching of calcium hydroxide is not required. On this basis, the staff finds this acceptable.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 structures due to elevated temperature. The applicant stated that at WCGS, during normal plant operation, a thermal loading is generated on the primary shield wall around the reactor cavity. An insulation and cooling system is provided on the inside face of the wall to reduce the severity of this loading by limiting the concrete temperatures to 150 °F except for the area directly below the seal ring support which is limited to 220 °F. An engineering evaluation was performed to ensure that this elevated temperature would not be detrimental to the ability of the concrete to perform its intended functions. High energy line penetrations have been designed with flued heads to dissipate the heat from these process pipes, and insulation has been installed to further limit the exposure of the concrete. The applicant stated that accessible concrete components will be monitored by the Structures Monitoring Program to identify and manage any visible effects due to elevated temperatures.

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)).

During the audit, the staff requested that the applicant provides the maximum temperatures that concrete experiences in Groups 1-5 structures.

In its response, the applicant stated that, for normal plant operation, the primary shield wall concrete temperatures are limited to 150 °F except for the area directly below the seal ring support which is limited to 220 °F. The applicant stated that the WCGS' technical specifications require that containment average air temperature be less than or equal to 120 °F. The containment cooling system provides cooling to ensure temperature limits are not exceeded. The highest concrete temperature in the area directly below the seal ring support is not load bearing.

On the basis of its review, the staff determines that the reduction of strength and modulus of concrete structures due to elevated temperatures is not a plausible aging effect because these aging mechanisms do not exist. The applicant stated that the aging effects due to elevated temperature are not expected at WCGS for the concrete associated with Groups 1 through 5 structures because the general area temperatures within the primary containment do not exceed 150 °F, except for the area directly below the seal ring support which is limited to 220 °F, and local area temperatures do not exceed 200 °F.

On the basis of its review, the staff finds that the applicant's response that accessible concrete components will be monitored by the Structures Monitoring Program to identify and manage any visible effects due to elevated temperatures to the Groups 1 through 5 structures concrete is acceptable. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.21. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report, and is adequate for managing reduction of strength and modulus of concrete structures due to elevated temperatures.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.2.3 criteria. For those line items that apply to LRA Section 3.5.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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:

(1) LRA Section 3.5.2.2.2.4 addresses aging management of inaccessible areas for Group 6 structures: aggressive chemical attack and corrosion of embedded steel. The applicant stated that reinforced concrete structures at WCGS 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes. The applicant stated that crack control was achieved through proper sizing, spacing, and distribution of reinforcing steel in accordance with ACI 318-71. Monthly tests conducted from June 2005 to May 2006 showed that the groundwater and soil at

WCGS have pH values between 7.0 and 8.7, which are above the recommended minimum pH of 5.5. These tests also show that chloride solutions range from 5.0 to 41.2 ppm, and sulfate solutions range from 30 to 717 ppm. These results compare favorably to the recommended limits of less than 500 ppm and less than 1500 ppm, respectively. The applicant stated that WCGS is located in a geologically and environmentally stable area. It also stated that groundwater chemistry is not expected to change significantly in the future; therefore, further evaluation for the effects of aggressive chemical attack and corrosion of embedded steel is not required.

SRP-LR Section 3.5.2.2.2.4 states that increase in porosity and permeability, cracking, loss of material (spalling, scaling), aggressive chemical attack and cracking, loss of bond, and loss of material (spalling, scaling), corrosion of embedded steel may occur in below-grade inaccessible concrete areas of Group 6 structures. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects in inaccessible areas in aggressive environments.

On the basis of its review, the staff determines that the increase in porosity and permeability, cracking, loss of material (i.e., spalling, scaling), and aggressive chemical attack, along with cracking, loss of bond, and loss of material (i.e., spalling, scaling), and corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures are not significant aging effects at WCGS due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.1R-92.

The applicant credited the Inspection of Water Control Structures Program to manage these aging effects. The staff's evaluation of the Inspection of Water Control Structures Program is documented in SER Section 3.0.3.2.22. Furthermore, by letter dated July 26, 2007 the applicant committed (Commitment No. 17) to monitor groundwater for pH, sulfates, and chlorides. Two samples of groundwater will be tested every five years. Therefore, further evaluation of the effects of aggressive groundwater chemistry is not required.

The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and are adequate to manage an increase in porosity and permeability, cracking, loss of material (i.e., spalling, scaling), and aggressive chemical attack, along with cracking, loss of bond, and loss of material (i.e., spalling, scaling), and corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures.

(2) LRA Section 3.5.2.2.2.4 addresses aging management of inaccessible areas for Group 6 structures: freeze-thaw. The applicant stated that, as described in USAR Section 2.3.2.1.1, the average monthly temperatures at WCGS range from 80 °F in July and August to 29 °F in January, with extremes recorded as high as 117 °F and as low as -27 °F. Reinforced concrete structures at WCGS were designed, constructed, and inspected in accordance with 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 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes; therefore, further evaluation for the effects of freeze-thaw is not required.

SRP-LR Section 3.5.2.2.2.4 states that loss of material (spalling, scaling) and cracking due to freeze-thaw may occur in below-grade inaccessible concrete areas of Group 6 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas for plants located in moderate to severe weather conditions.

On the basis of its review, the staff determines that the loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw in below grade inaccessible concrete areas of Group 6 structures are not aging effects at WCGS because the concrete was constructed in accordance with ACI and ASTM standards with a high-cement, low water-to-cement ratio. Therefore, the staff finds that further evaluation of the effects of freeze-thaw is not required. The applicant credited the Inspection of Water Control Structures Program to manage these aging effects. The staff's evaluation of the Inspection of Water Control Structures Program is documented in SER Section 3.0.3.2.22. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and is adequate to manage loss of material (i.e., spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures.

(3) LRA Section 3.5.2.2.2.4 addresses aging management of inaccessible areas for Group 6 structures: reaction with aggregates and leaching of calcium hydroxide. The applicant stated that testing and petrographic examination, performed in accordance with ASTM C295, demonstrated that the concrete aggregates at WCGS are non-reactive. Therefore, further evaluation for the effects of reaction with aggregates is not required.

Reinforced concrete structures at WCGS 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. Design practices and procedural controls ensured that the concrete was consistent with the recommendations and guidance provided by ACI 201.2R. The mixes were designed with entrained air content between 3 and 6 percent, and the concrete slumps were controlled throughout the batching, mixing, and placement processes; therefore, further evaluation for the effects of leaching of calcium hydroxide is not required.

SRP-LR Section 3.5.2.2.2.4 states that cracking due to expansion and reaction with aggregates and increased porosity and permeability and loss of strength due to leaching of calcium hydroxide may occur in below-grade inaccessible reinforced concrete areas of Group 6 structures. The GALL Report recommends further evaluation of inaccessible areas for concrete not constructed in accordance within ACI 201.2R-77 recommendations.

On the basis of its review, the staff determines that cracking due to expansion and reaction with aggregates, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Group 6 structures are not aging effects at WCGS because the concrete was constructed in accordance with ACI and ASTM standards. The staff finds that the concrete was constructed with a high-cement, low water-to-cement ratio and the below-grade environment is nonaggressive. Therefore, further evaluation of the effects of reaction with aggregates and leaching of calcium hydroxide is not required. However, the applicant credited the Inspection of Water Control Structures Program to manage these aging effects. The staff's evaluation of the Inspection of Water Control Structures Program is documented in SER Section 3.0.3.2.22. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and is adequate to manage cracking due to expansion and reaction with aggregates and the increase in porosity and permeability due to leaching of calcium hydroxide in below-grade, inaccessible concrete areas of Group 6 structures.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.5.2.2.2.4 criteria. For those line items that apply to LRA Section 3.5.2.2.2.4, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 SCC and loss of material due to pitting and crevice corrosion. The applicant stated that this aging effect is not applicable because WCGS does not have stainless steel tank liners exposed to water-standing within the scope of license renewal. Therefore, the applicable GALL Report line items were not used.

SRP-LR Section 3.5.2.2.2.5 states that cracking due to SCC and loss of material due to pitting and crevice corrosion may occur in Groups 7 and 8 stainless steel tank liners exposed to standing water. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects.

The staff noted that this item is applicable to stainless steel tank liners exposed to standing water. On the basis that WCGS does not have stainless steel tank liners exposed to standing-water that are within the scope of license renewal, the staff finds that this line is not applicable.

Based on the above, the staff concludes that the applicant meets SRP-LR Section 3.5.2.2.2.5 criteria. The staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging of Supports Not Covered by the Structures Monitoring Program.

The staff reviewed LRA Section 3.5.2.2.2.6 against the criteria in SRP-LR Section 3.5.2.2.2.6.

LRA Section 3.5.2.2.2.6 addresses aging of supports not covered by the Structures Monitoring Program. The applicant stated that building concrete, HVAC duct supports, instrument supports, non-ASME mechanical equipment supports, non-ASME supports, and electrical panels and enclosures are inspected by the Structures Monitoring Program; therefore, no further evaluation is required.

SRP-LR Section 3.5.2.2.2.6 states that the GALL Report recommends further evaluation of certain component support-aging effect combinations not covered by structures monitoring programs, including (1) loss of material due to general and pitting corrosion for Groups B2-B5 supports, (2) reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1-B5 supports, and (3) reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports. Further evaluation is necessary only for structure-aging effect combinations not covered by the applicant's structures monitoring program.

The staff noted that loss of material due to general and pitting corrosion for Groups B2 through B5 supports components is an aging effect that requires management. The applicant credits the Structures Monitoring Program to manage this aging effect.

The staff noted that concrete anchors and surrounding concrete for Groups B1 through B5 are included in the Structures Monitoring Program. Also it noted that the applicant did not identify any component support structure and aging effect combination that corresponds to the GALL Report, Volume 2, Item III.B4.2-a, that addressed reduction and loss of isolation function due to degradation of vibration isolation elements for Group B4 supports.

The staff noted that WCGS does not have vibration isolation elements for Group B4 supports that are within the scope of license renewal; therefore, the staff finds that this line is not applicable.

On the basis of its review, the staff finds that the applicant included the aging effect and material combinations discussed in the SRP-LR within the scope of its Structures Monitoring Program, and finds that no further evaluation is required. The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.21. The staff finds that this program includes activities that are consistent with the recommendations in the GALL Report and that is adequate to manage the aging effects of loss of material due to general and pitting corrosion for Groups B2 through B5 supports and reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1 through B5 supports.

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 determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cumulative Fatigue Damage Due to Cyclic Loading.

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

In LRA Tables 3.5.2-1 through 3.5.2-22, the staff reviewed additional details of the AMR results for material, environment, AERM, and AMP combinations not consistent with or not addressed in the GALL Report.

In LRA Tables 3.5.2-1 through 3.5.2-22, 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 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Reactor Building – LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of AMR evaluations for the reactor building component groups.

In LRA Table 3.5.2-1 the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps, and fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

In LRA Table 3.5.2-1, the applicant stated that fatigue is a TLAA for carbon steel penetration component, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with

10 CFR 54.21(c)(1). SER Section 4.6.2 documents the staff's review of the applicant's evaluation of this TLAA.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.2 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Control Building – LRA Table 3.5.2-2

The staff reviewed LRA Table 3.5.2-2, which summarizes the results of AMR evaluations for the control building component groups.

In LRA Table 3.5.2-2, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps component, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps component, fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.3 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Diesel Generator Building – LRA Table 3.5.2-3

The staff reviewed LRA Table 3.5.2-3, which summarizes the results of AMR evaluations for the DG building component groups.

In LRA Table 3.5.2-3, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps component, fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.4 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Turbine Building – LRA Table 3.5.2-4

The staff reviewed LRA Table 3.5.2-4, which summarizes the results of AMR evaluations for the turbine building component groups.

In LRA Table 3.5.2-4, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps components, and fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.5 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Auxiliary Building – LRA Table 3.5.2-5

The staff reviewed LRA Table 3.5.2-5, which summarizes the results of AMR evaluations for the auxiliary building component groups.

In LRA Table 3.5.2-5, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps components, and fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.6 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Radwaste Building – LRA Table 3.5.2-6

The staff reviewed LRA Table 3.5.2-6, which summarizes the results of AMR evaluations for the radwaste building component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-6 are consistent with 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 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Emergency Fuel Oil Tank Vaults – LRA Table 3.5.2-7

The staff reviewed LRA Table 3.5.2-7, which summarizes the results of AMR evaluations for the emergency fuel oil tank vaults component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-7 are consistent with 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 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Electrical Duct Banks and Manways – LRA Table 3.5.2-8

The staff reviewed LRA Table 3.5.2-8, which summarizes the results of AMR evaluations for the essential service water electrical duct banks and manways component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-8 are consistent with 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 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Communications Corridor – LRA Table 3.5.2-9

The staff reviewed LRA Table 3.5.2-9, which summarizes the results of AMR evaluations for the communications corridor component groups.

In LRA Table 3.5.2-9, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps components, and fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.10 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Transmission Towers – LRA Table 3.5.2-10

The staff reviewed LRA Table 3.5.2-10, which summarizes the results of AMR evaluations for the transmission towers component groups.

In LRA Table 3.5.2-10, the applicant proposed to manage loss of material in treated wood material by using the Structures Monitoring Program.

The staff's evaluation of the Structures Monitoring Program is documented in SER Section 3.0.3.2.21. The staff finds that the Structures Monitoring Program manages the cracking, loss of material, and change in material properties by monitoring the condition of structures and structures supports that are in within the scope of license renewal. The staff finds that the program will be enhanced to add inspection parameters for treated wood. 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, the aging effect of treated wood material is effectively managed by using the Structures 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).

3.5.2.3.11 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Access Vaults – LRA Table 3.5.2-11

The staff reviewed LRA Table 3.5.2-11, which summarizes the results of AMR evaluations for the essential service water access vaults component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-11 are consistent with 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 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Fuel Building – LRA Table 3.5.2-12

The staff reviewed LRA Table 3.5.2-12, which summarizes the results of AMR evaluations for the fuel building component groups.

In LRA Table 3.5.2-12, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps components, and fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

In LRA Table 3.5.2-12, the applicant stated that fatigue is a TLAA for stainless steel liner spent fuel pool component, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3.6 documents the staff's review of the applicant's evaluation of this TLAA.

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).

3.5.2.3.13 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Pumphouse Building – LRA Table 3.5.2-13

The staff reviewed LRA Table 3.5.2-13, which summarizes the results of AMR evaluations for the essential service water pumphouse building component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-13 are consistent with 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).

3.5.2.3.14 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Circulating Water Screenhouse – LRA Table 3.5.2-14

The staff reviewed LRA Table 3.5.2-14, which summarizes the results of AMR evaluations for the circulating water screenhouse component groups.

In LRA Table 3.5.2-14, the applicant proposed to manage loss of material and cracking in fire barrier coatings and wraps components, and fire barrier (i.e., ceramic fiber) material by using the Fire Protection Program.

The staff's evaluation of the Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff finds that the Fire Protection Program will visually inspect 10 percent of each type of electrical and mechanical penetration seal 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 coatings and wraps components, and fire barrier (i.e., ceramic fiber) material is effectively managed by using the Fire Protection Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.15 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Ultimate Heat Sink – LRA Table 3.5.2-15

The staff reviewed LRA Table 3.5.2-15, which summarizes the results of AMR evaluations for the ultimate heat sink component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-15 are consistent with 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).

3.5.2.3.16 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Discharge Structure – LRA Table 3.5.2-16

The staff reviewed LRA Table 3.5.2-16, which summarizes the results of AMR evaluations for the essential service water discharge structure component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-16 are consistent with 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).

3.5.2.3.17 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Main Dam and Auxiliary Spillway – LRA Table 3.5.2-17

The staff reviewed LRA Table 3.5.2-17, which summarizes the results of AMR evaluations for the main dam and auxiliary spillway component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-17 are consistent with 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).

3.5.2.3.18 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Essential Service Water Valve House – LRA Table 3.5.2-18

The staff reviewed LRA Table 3.5.2-18, which summarizes the results of AMR evaluations for the essential service water valve house component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-18 are consistent with 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).

3.5.2.3.19 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Refueling Water Storage Tank Foundation and Valve House – LRA Table 3.5.2-19

The staff reviewed LRA Table 3.5.2-19, which summarizes the results of AMR evaluations for the refueling water storage tank foundation and valve house component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-19 are consistent with 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).

3.5.2.3.20 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Condensate Storage Tank Foundation and Valve House – LRA Table 3.5.2-20

The staff reviewed LRA Table 3.5.2-20, which summarizes the results of AMR evaluations for the CST foundation and valve house component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-20 are consistent with 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).

3.5.2.3.21 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Concrete Support Structures for Station Transformers – LRA Table 3.5.2-21

The staff reviewed LRA Table 3.5.2-21, which summarizes the results of AMR evaluations for the concrete support structures for station transformers component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.5.2-21 are consistent with 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).

3.5.2.3.22 Containments, Structures, and Component Supports - Summary of Aging Management Evaluation - Supports – LRA Table 3.5.2-22

The staff reviewed LRA Table 3.5.2-22, which summarizes the results of AMR evaluations for the supports component groups.

In LRA Table 3.5.2-22, the applicant stated that fatigue is a TLAA for carbon steel support fittings 1E cable tray, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.3.7 documents the staff's review of the applicant's evaluation of this TLAA.

The staff noted that in LRA Table 3.5.2-22, for carbon steel ASME 2 and 3 supports, the applicant stated that no fatigue or cycle design analysis exist for these supports at WCGS. Therefore, there is no TLAA performed for these supports. Also, the staff noted that the applicant proposed to manage loss of material in carbon steel support mechanical equipments Class 2 and 3 using the ASME Code Section XI, Subsection IWF.

The staff's evaluation of the ASME Code Section XI, Subsection IWF Program is documented in SER Section 3.0.3.2.19. The staff finds that the ASME Code Section XI, Subsection IWF Program will perform visual examination of supports based on sampling of the total support population. Degradation that potentially compromises support function or load capacity is identified for evaluation. 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 based on sampling of the total support population, the aging effect is effectively managed by using the ASME Code Section XI, Subsection IWF Program.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 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

This section of the SER documents the staff's review of the applicant's AMR results for the electrical and I&C components and component groups of:

- cable connections (metallic parts)
- connectors
- high-voltage insulators
- insulated cables and connections
- penetrations electrical
- switchyard bus and connections
- terminal blocks
- transmission conductors and connections
- electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements

3.6.1 Summary of Technical Information in the Application

LRA Section 3.6 provides AMR results for the electrical and I&C components and component groups. LRA Table 3.6.1, "Summary of Aging Management Evaluations in Chapter VI of NUREG-1801 for Electrical Components," is a summary comparison of the applicant's AMRs with those evaluated in the GALL Report for the electrical and I&C 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 components within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to ensure the applicant's claim that certain AMRs were consistent with the GALL Report. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are documented in SER Section 3.6.2.1.

In the onsite audit, the staff also selected AMRs consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the SRP-LR Section 3.6.2.2 acceptance criteria. The staff's audit evaluations are documented in SER Section 3.6.2.2.

The staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The technical review evaluated whether all plausible aging effects have been identified and whether the aging effects listed were appropriate for the material-environment combinations specified. The staff's evaluations are documented in SER Section 3.6.2.3.

For SSCs which the applicant claimed were not applicable or required no aging management, the staff reviewed the AMR line items and the plant's operating experience to verify the applicant's claims.

Table 3.6-1 summarizes the staff's evaluation of components, aging effects 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 Environmental Qualification of Electrical Components (B3.2)	Consistent with GALL Report (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	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.24)	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
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	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B2.1.25)	Consistent with GALL Report
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	Inaccessible Medium-Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.26)	Consistent with GALL Report
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 (B2.1.4)	Consistent with GALL Report
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 WCGS (See SER Section 3.6.2.1.1)
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 WCGS (See SER Section 3.6.2.1.1)

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
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 WCGS (See SER Section 3.6.2.1.1)
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 WCGS (See SER Section 3.6.2.1.1)
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 WCGS (See SER Section 3.6.2.1.1)
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	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B2.1.36)	Consistent with GALL Report (See SER Section 3.6.2.1.2)
Fuse Holders (Not Part of a Larger Assembly) - insulation material (3.6.1-14)	None	None	No	Not applicable	Not applicable to WCGS (See SER Section 3.6.2.1.1)

The staff's review of the electrical and I&C 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 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 components:

- Boric Acid Corrosion
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits
- Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements
- Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements

LRA Table 3.6.2-1 summarizes AMRs for the electrical and instrumentation and controls (I&C) components and indicates 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 the GALL Report does not recommend further evaluation, the staff's audit and review determined whether the plant-specific components of these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant noted for each AMR line item how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E indicating how the AMR is consistent with the GALL Report.

Note A indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and validity of the AMR for the site-specific conditions.

Note B indicates that the AMR line item is consistent with the GALL Report for component, material, environment, and aging effect. In addition, the AMP takes some exceptions to the GALL AMP. The staff audited these line items to verify consistency with the GALL Report and verified that the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note C indicates that the component for the AMR line item, although different from, is consistent with the GALL Report for material, environment, and aging effect. In addition, the AMP is consistent with the GALL AMP. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified in the GALL Report a different component with the same material, environment, aging effect, and AMP as the component under review. The staff audited these line items to verify consistency with the GALL Report. The staff also 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 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 verified whether the identified exceptions to the GALL AMPs have been reviewed and accepted. The staff also determined whether the applicant's AMP was consistent with the GALL AMP and whether the AMR was valid for the site-specific conditions.

Note E indicates that the AMR line item is consistent with the GALL Report for material, environment, and aging effect, but credits a different AMP. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the credited AMP would manage the aging effect consistently with the GALL AMP and whether the AMR was valid for the site-specific conditions.

The staff audited and reviewed the information in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs.

The staff reviewed the LRA to confirm that the applicant: (a) provided a brief description of the system, components, materials, and environments; (b) stated that the applicable aging effects were reviewed and evaluated in the GALL Report; and (c) identified those aging effects for the electrical and I&C components that are subject to an AMR. On the basis of its audit and review, the staff determines that, for AMRs not requiring further evaluation, as identified in LRA Table 3.6.1, the applicant's references to the GALL Report are acceptable and no further staff review is required.

3.6.2.1.1 AMR Results Identified as Not Applicable

The staff reviewed LRA Table 3.6.1, which summarizes the results of AMR evaluations in the GALL Report for the electrical and I&C component groups.

In LRA Table 3.6.1, items 6 and 14, the applicant stated 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) metallic clamp, and that the aging effect or mechanism of fuse holder insulation are not applicable. The applicant stated that all fuse holders, including the fuses installed for electrical penetration protection, are part of larger assemblies.

The staff noted that in Interim Staff Guidance-5, "Identification and Treatment of Electrical Fuse Holders for License Renewal," the staff provided examples of typical fuse holders that require an AMR. These are fuses that are installed separately in fuse holder panels which are used as protective devices to ensure the integrity of containment penetration or that are used as isolation devices between Class 1E and non-Class 1E electrical circuits.

During the audit, the staff requested that the applicant explain why the fuse holders installed in an electrical containment protection assembly are considered part of a larger active assembly that do not require an AMR.

In its response, the applicant stated that the electrical containment penetration assemblies at WCGS do not incorporate self-fusing characteristics and must be protected externally. The fuses that are used to protect the electrical containment penetration are installed in larger assemblies (i.e., motor control center cubicles, main control boards, distribution panels, etc.).

The staff noted that in accordance to Interim Staff Guidance-5 and 10 CFR 50.54, fuse holders installed in an active assembly are part of an active assembly and an AMR need not be performed. Therefore, the staff finds the applicant's response acceptable.

During the audit, the staff also requested that the applicant identify fuse holders installed separately as isolation devices between Class 1E and non-Class 1E electrical circuits and explain why these fuses do not require an AMR.

In its response, the applicant stated that the WCGS controlled fuse list does not identify which of the 2500 fuses are used as isolation devices between Class 1E and non-Class 1E electrical circuits. The fuse list does identify the locations for all of the fuses. A review of this list determined that there are no fuses within the scope of license renewal that are not installed as part of larger assemblies. The aging of the components including the fuse holders within these assemblies is managed as part of the active component. The applicant clarified that WCGS did not install fuses in standalone fuse panels or cabinets.

The staff finds the applicant's response acceptable because only the fuses that are installed in fuse panels or cabinets need to have an AMR performed. The staff finds that these fuse holders are part of an active assembly and; therefore, an AMR is not required.

In LRA Table 3.6.1, items 7, 8, 9, and 10, the applicant stated that WCGS has no metal enclosed bus within the scope of license renewal.

During the audit, the staff verified that WCGS has no metal enclosed bus within the scope of license renewal and; therefore, these GALL Report line items are not applicable.

3.6.2.1.2 Loosening of Bolted Connections Due to Thermal Cycling, Ohmic Heating, Electrical Transients, Vibration, Chemical Contamination, Corrosion, and Oxidation

The staff noted that GALL Report, Chapter VI, Item VI.A-1, for cable connections (metallic parts), lists an environment of air indoor and air outdoor. LRA Table 3.6.2-1 lists an environment of air indoor; however, it does not include outdoor air.

During the audit, the staff requested that the applicant justify why oxidation of cable connections is not an aging effect for cable connections in an outdoor environment.

In its response, the applicant stated that it would amend LRA Table 3.6.2-1 to include electrical cable connections exposed to outdoor air. By letter dated August 31, 2007, the applicant revised LRA Table 3.6.2-1 to include an outdoor air environment for cable connections.

The staff finds the applicant's response acceptable because oxidation of cable connections is a potential aging mechanism in an environment of outdoor air. The staff finds that this environment is now consistent with the recommendations in the GALL Report.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with its AMRs. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2 AMR Results Consistent with the GALL Report for Which Further Evaluation is Recommended

In LRA Section 3.6.2.2, the applicant further evaluates aging management, as recommended by the GALL Report, for the electrical and I&C components and provides information concerning how it will manage the following aging effects and related QA:

- 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 GALL Report recommends further evaluation, the staff audited and reviewed the applicant's evaluation to determine whether it adequately addressed the issues further evaluated. In addition, the staff reviewed the applicant's further evaluations against the criteria contained in SRP-LR Section 3.6.2.2. The staff's review of the applicant's further evaluation follows.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

LRA Section 3.6.2.2.1 states that EQ is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). SER Section 4.4 documents the staff's review of the applicant's evaluation of this TLAA.

3.6.2.2.2 Degradation of Insulator Quality Due to Salt Deposits or Surface Contamination, Loss of Material Due to Mechanical Wear

The staff reviewed LRA Section 3.6.2.2.2 against the criteria in SRP-LR Section 3.6.2.2.2.

LRA Section 3.6.2.2.2 addresses degradation of insulator quality due to presence of any salt deposits and surface contamination, and loss of material due to mechanical wear. The applicant stated that WCGS is located in an area with moderate rainfall and where the outdoor environment is not subject to industry air pollution or salt spray. Contamination buildup on the high-voltage insulators is not a problem due to rainfall periodically washing the insulators. Additionally, there is no salt spray at the plant since the plant is not located near the ocean. The applicant stated that degradation of insulator quality in the absence of salt deposits and surface contamination is not an aging effect requiring management. Industry experience has shown that transmission conductors are designed and installed not to swing significantly and cause wear, due to wind-induced abrasion and fatigue. The WCGS transmission conductors are designed and installed not to swing significantly and cause wear due to wind induced abrasion and fatigue. Therefore, loss of material due to wind induced abrasion and fatigue is not an applicable aging effect requiring management.

SRP-LR Section 3.6.2.2.2 states that degradation of insulator quality due to salt deposits or surface contamination may occur in high-voltage insulators. The GALL Report recommends further evaluation of plant-specific AMPs for plants at locations of potential salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution). Loss of material due to mechanical wear caused by wind on transmission conductors may occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff noted that various airborne materials such as dust, salt, and industrial effluent can contaminate insulator surface. The buildup of surface contamination is gradual and in most areas washed away by rain. The glazed insulator surface aids this contamination removal. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the sea coast where salt spray is prevalent. Since WCGS is not located near facilities that discharge soot or near the sea coast, the staff finds that surface contamination is not an applicable aging effect requiring management for high-voltage insulators at WCGS.

The staff also noted that mechanical wear could be an aging effect for strain and suspension insulators if they are subject to movement. Movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. If this swinging is frequent enough, it could cause wear in the metal contact points of the insulator string and between an insulator and supporting hardware. Although this is possible, industry experience has shown transmission conductors do not normally swing and that when they do, due to substantial wind, they do not continue to swing for very long once the wind has subsided. The staff finds that the applicant considered wind loading that could cause a transmission line and insulator to vibrate in its design and installation. In addition, the applicant confirmed that none of the industry operating experience has shown that transmission conductors swing significantly and cause wear. Therefore, the staff finds that loss of material of insulator caused by transmission conductor vibration or sway is not a significant aging effect requiring management at WCGS.

Based on the programs identified above, the staff concludes that the applicant's programs meet SRP-LR Section 3.6.2.2.2 criteria. For those line items that apply to LRA Section 3.6.2.2.2, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.3 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.

LRA Section 3.6.2.2.3 addresses 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 applicant stated that industry experience has shown that transmission conductors are designed and installed not to swing significantly and cause wear due to wind induced abrasion and fatigue. Therefore, loss of material due to wind induced abrasion and fatigue is not an applicable aging effect requiring management. The applicant stated that the most prevalent mechanism contributing to loss of conductor strength of an Aluminum Conductor Steel Reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. ACSR conductor degradation begins as a loss of zinc from the galvanized steel core wires. Corrosion rates depend largely on air quality, which involves suspended particles in the air, sulphur dioxide concentration, rain, fog chemistry, and other weather conditions. The WCGS outdoor environment is not subject to industry air pollution or saline environment that would cause significant corrosion of the transmission conductors.

The applicant stated that the National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60 percent of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind, and temperature. At WCGS the ACSR transmission conductors with a core of 7 steel strands have ultimate conductor strength of 42,200 lbs. The WCGS ACSR transmission conductors within the scope of license renewal are installed so that conductor tension does not exceed 9,900 lbs at the NESC heavy loading condition (23 percent of the ultimate conductor strength). Tests performed by Ontario Hydroelectric on ACSR transmission conductors showed a 30 percent loss of ultimate conductor strength due to corrosion. Assuming a 30 percent loss of ultimate conductor strength (12,660 lbs) due to corrosion over 60 years, the WCGS ACSR transmission conductors have adequate design margin to offset the loss of strength due to corrosion and still meet the NESC requirement of not exceeding 60 percent of the ultimate conductor strength (17,724 lbs). The Ontario Hydroelectric test envelops the conductors at WCGS, and based on the conservatism in strength margin, demonstrates that the material loss on the WCGS ACSR transmission conductors is acceptable for the period of extended operation. Therefore, corrosion is not a credible aging effect that requires management for the period of extended operation.

The applicant stated that transmission conductor connections at the time of installation are treated with corrosion inhibitors to avoid connection oxidation and torqued to avoid loss of pre-load. Based on temperature data described in USAR Section 2.3, the transmission connections do not experience thermal cycling. The transmission connections are subject to average monthly temperatures ranging from 80 °F in July and August to 29 °F in January with minimal ohmic heating. Therefore, increased resistance of connections due to oxidation or loss of pre-load is not an aging effect requiring management. In addition, the applicant stated that the outdoor environment at WCGS is not subject to industry air pollution or saline environment. Aluminum bus material, galvanized steel support hardware, and stainless steel connection material do not experience any appreciable aging effects in this environment. The design incorporates the use of stainless steel "Belleville" washers on the switchyard bus bolted electrical connections of dissimilar metals to compensate for temperature changes, to maintain the proper torque and prevent loss of pre-load.

SRP-LR Section 3.6.2.2.3 states that loss of material due to wind-induced abrasion and fatigue, loss of conductor strength due to corrosion, and increased resistance of connection due to oxidation or loss of pre-load may occur in transmission conductors and connections and in switchyard bus and connections. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff finds that the transmission conductors at WCGS are designed and installed not to swing significantly and cause wear; therefore, mechanical wear is not an applicable aging effect that can cause a loss of intended function of the transmission conductors.

The staff also finds that corrosion of an ACSR conductor is a very slow acting mechanism, and test data from Ontario Hydroelectric, which is bounded by the types of conductors at WCGS, illustrates that transmission conductors will have ample strength through the period of extended operation. Based on this information, the staff concludes that loss of conductor strength is not a significant aging effect requiring management at WCGS.

In LRA Table 3.6.1, item 12, the applicant stated that for transmission conductors and connections and switchyard bus and connections, the aging effect in the GALL Report for this material and environment combination is not applicable.

The staff noted that SRP-LR Section 3.6.2.2.3 states that increased resistance of connections due to oxidation or loss of pre-load could occur in transmission conductor connections and in switchyard bus connections. Further, EPRI document TR-104213, "Bolted Joint Maintenance & Application Guide," states that increased temperature difference in electrical bolted joints is due to high circuit rating or increased current duration. The temperature of an electrical bolted joint will rise and stress will increase with increasing current duration. If this temperature increase is not taken into consideration, loose or failure joint will result.

During the audit, the staff requested that the applicant explain why torque relaxation for bolted connections of switchyard bus and transmission conductors is not a concern at WCGS. The staff also requested that the applicant explain why increased resistance of bolted connections due to oxidation is not a concern for switchyard bus and transmission conductor connections.

In its response, the applicant stated that torque relaxation for bolted connections of switchyard bus and transmission conductors is not a concern because it uses stainless steel bolts with stainless steel washers to maintain the proper torque and prevent loss of pre-load. The bolted transmission connections that are within the scope of license renewal are at the startup transformer XMR01 and disconnect 345-163. These connections are periodically evaluated with thermography as part of the preventive maintenance activities performed on the startup transformer and disconnect. Based on temperature data provided in USAR Chapter 2.3, the transmission connections do not experience thermal cycling. The transmission connections are subject to average monthly temperatures ranging from 80 °F in July and August to 29 °F in January, with minimal ohmic heating.

The applicant also stated that the corrosion inhibitors compound (i.e., a grease-type sealant) is a consumable which is used for initial assembly of bolted connections and is replaced as required when connections are taken apart and reassembled (e.g., during routine maintenance). The compound is weather resistant and adheres to the connection to ensure low contact resistance. Based on operating experience, this method of installation has been shown to provide a corrosion-resistant low electrical resistance connection. Also, the applicant clarified that the plant outdoor environment is not subject to industry air pollution or saline environment. The connection does not experience any appreciable aging effects in this environment. Therefore, the applicant concluded that general corrosion resulting in the oxidation of transmission connection surface metals is not an aging effect requiring management at WCGS.

Further, the applicant stated that periodic thermography will continue during the period of extended operation. The applicant also provided a copy of a thermography report for the startup transformer dated October 23, 2003, along with a copy of the work order history. The thermography results showed that based on the transmission line capacity versus the connected load, these connections experience minimal to no ohmic heating. These electrical bolted joints do not experience high circuit rating or increased current duration, as discussed in EPRI document TR-104213. By letter dated August 31, 2007, the applicant amended LRA Section 3.6.2.2.3 to state:

> The WCGS outdoor environment is not subject to industry air pollution or saline environment. Aluminum bus material, galvanized steel support hardware, and stainless steel connection material do not experience any appreciable aging effects in this environment. These connections are periodically evaluated via thermography as part of the preventive maintenance activities performed on the startup transformer and disconnect. The periodic thermography will continue into the period of extended operation.

The staff reviewed the infrared thermography report data and verified that the startup transformer connections experienced minimal ohmic heating. Based on the data, the staff determines that these electrical bolted connections do not experience high temperature as a result of ohmic heating. Anti-oxidant compound is used in bolted connections to prevent the formation of oxides on the metal surface and to prevent moisture entering the connections, thus, reducing the chances of corrosion. Therefore, the staff finds that increased resistance of bolted connections due to oxidation is not an aging effect requiring management at WCGS.

The staff finds that because the startup transformer connections experienced minimal ohmic heating, bolt loosening due to ohmic heating is not an aging effect requiring management at WCGS. In addition, a periodic infrared thermography inspection on the startup transformer and disconnect is performed as part of preventive maintenance activities to maintain the integrity of switchyard connections that are within the scope of license renewal. The staff finds that this inspection will continue during the period of extended operation. On the basis of its review, 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 3.6.2.2.3 criteria. For those line items that apply to LRA Section 3.6.2.2.3, the staff determines that the LRA is consistent with the GALL Report and that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2.4 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 Summary of Aging Management Evaluation Electrical Components – LRA Table 3.6.2-1

The staff reviewed LRA Table 3.6.2-1, which summarizes the results of AMR evaluations for the electrical and I&C component groups. On the basis of its review, the staff finds that all AMR results described in LRA Table 3.6.2-1 are consistent with the GALL Report.

The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the electrical and I&C 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 <u>Conclusion for Aging Management Review Results</u>

The staff reviewed the information in LRA Section 3, "Aging Management Review Results," and LRA Appendix B, "Aging Management Programs." 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 USAR supplement program summaries and concludes that the supplement adequately describes the AMPs credited for managing aging, as required by 10 CFR 54.21(d).

With regard to these matters, the staff concludes that there is reasonable assurance that the applicant will continue to conduct the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and any changes made to the CLB, in order to comply with 10 CFR 54.21(a)(3), 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, Wolf Creek Nuclear Operating Corporation (WCNOC or the applicant) addressed the TLAAs for Wolf Creek Generating Station (WCGS), Unit 1. SER Sections 4.2 through 4.8 document the review of the TLAAs conducted by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff).

TLAAs are certain plant-specific safety analyses that involve time-limited assumptions defined by the current operating term. 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 WCGS 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 safety analysis report (USAR), engineering calculations, technical reports, engineering work requests, licensing correspondence, and applicable vendor reports. LRA Table 4.1-1, "List of TLAAs," lists applicable TLAAs:

- reactor vessel neutron embrittlement
- metal fatigue
- environmental qualification of electrical equipment
- concrete containment tendon prestress
- containment liner plate, polar crane bracket, and penetration load cycles
- containment polar crane, fuel building cask handling crane, spent fuel pool bridge crane, and fuel handling machine CMAA-70 load cycle limits
- absence of a TLAA for reactor vessel underclad cracking analyses
- absence of a TLAA in a reactor coolant pump flywheel fatigue crack growth analysis

Pursuant to 10 CFR 54.21(c)(2), the applicant identified an exemption granted under 10 CFR 50.12 based on a TLAA as defined in 10 CFR 54.3. The applicant listed the following exemption associated with TLAAs in LRA Section 4.3.2.11, "Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break (LBB) Elimination of Dynamic Effects of Primary Loop Piping Failures."

As stated in LRA Section 4.3.2.11, an LBB analysis eliminated the large breaks in the main reactor coolant loops, permitting omission of evaluations of their jet and pipe whip effects and of large jet barriers and whip restraints. The containment pressurization and equipment qualification analyses retained the large-break assumptions. The dynamic effects from postulated pipe breaks have been eliminated from the structural design basis of the reactor coolant system primary loop piping as allowed by General Design Criterion (GDC) 4 (as amended). The elimination of these breaks is the result of the application of LBB technology approved by the NRC. The final licensing basis LBB submission is the proprietary Westinghouse Commercial Atomic Power (WCAP)-10691, "Technical Basis for Eliminating Large Primary Loop Pipe Rupture as a Structural Design Basis for Callaway and Wolf Creek Plants." The NRC approval of this LBB use was granted with the SER for the original license as a 10 CFR 50.12 exemption from parts of GDC 4 and documented in NUREG-0881 (SER Section 3.6.1.1; Supplement 5).

4.1.2 Staff Evaluation

LRA Section 4.1 lists the WCGS TLAAs; the applicant also discussed an exemption (documented in Section 4.1.1) 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) involve systems, structures, and components within the scope of license renewal, as described in 10 CFR 54.4(a)

(2) consider the effects of aging

(3) involve time-limited assumptions defined by the current operating term (40 years)

(4) are determined to be relevant by the applicant in making a safety determination

(5) involve conclusions, or provide the basis for conclusions, related to the capability of the system, structure, and component to perform its intended functions as described in 10 CFR 54.4(b)

(6) 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 WCGS in LRA Table 4.1-1.

Pursuant to 10 CFR 54.21(c)(2), the 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 it was based on a TLAA. The applicant identified one TLAA-based exemption. Based on the information provided by the applicant regarding the process used to identify the exemption and its result, the staff concludes, in accordance with 10 CFR 54.21(c)(2), that there is one TLAA-based exemption that is justified for continuation through the period of extended operation.

4.1.3 Conclusion

On the basis of its review, the staff concludes that the applicant 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 4.3.2.11, that justifies the continuation of the exemption(s) pursuant to 10 CFR 50.12 for the period of extended operation.

4.2 Reactor Vessel Neutron Embrittlement Analysis

Reactor vessel materials are subject to embrittlement, primarily due to exposure to neutron radiation. Absorbed energy increases with temperature up to a maximum (the Charpy impact test "upper-shelf energy" (USE)). Neutron embrittlement decreases USE. Nil-ductility transition reference temperature (RT_{NDT}), is determined for vessel materials before irradiation and indicates temperatures above which impact tests will demonstrate an acceptable USE. Neutron embrittlement raises this transition temperature. This increase (ΔRT_{NDT}) means that higher temperatures are required for the material to continue to act in a ductile fashion. The pressure-temperature (P-T) curves are determined by the limiting adjusted reference temperatures (ARTs) or, if at end-of-life, (EOL ARTs). Low-temperature overpressure protection (LTOP) is provided by a cold overpressurization mitigation system (COMS), one of whose setpoints is determined by the calculation of the P-T limit curves. Concerns for the possibility of thermal shock to the vessel while at high pressure have required evaluation of a ductile-brittle transition temperature screening parameter for pressurized water reactor (PWR) vessel material susceptibility to pressurized thermal shock, (PTS), similar to evaluations of EOL ART. These limits and effects depend on lifetime neutron fluence, are part of the licensing basis, and support safety determinations and Technical Specification operating limits. Their calculations are therefore TLAAs. The supporting calculation of expected EOL vessel neutron fluence is similarly a TLAA. At WCGS, limiting-material coupons have been tested at exposures comparable to those expected at the end of the period of extended operation. The tests demonstrate EOL USE values with considerable margins above the 50 foot-pound acceptance criterion, and special methods were therefore unnecessary. The same tests demonstrate low values of EOL ART and therefore permit generous operating margins to P-T curve limits to the end of the period of extended operation. The same coupon tests similarly demonstrate considerable margins between the reference temperatures for pressurized thermal shock (RT_{PTS}) for the vessel materials at the EOL fluence, and their acceptance criteria.

4.2.1 Neutron Fluence, Upper-Shelf Energy, and Adjusted Reference Temperature

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1 summarizes the evaluation of neutron fluence, USE, and ART for the period of extended operation. The WCGS surveillance program is consistent with 10 CFR Part 50,

Appendix H. The coupons are actual samples from the materials in the vessel. However, the weld material test specimens were not taken from excess material from the beltline region, for which an exemption is granted in NUREG-0881, SER, Section 5.3.3. WCGS coupon capsules are lettered U, V, W, X, Y, and Z. The U, Y, V, and X coupons have been withdrawn and examined (in that order), and the last W and Z capsules have been placed in storage. The W and Z capsules were removed to the spent fuel pool during the 2005 refueling outage at about 16.5 effective full-power years (EFPY). These capsules had a lead factor of 4.11 and therefore reached a fluence equivalent to about 54 EFPY at the vessel surface at 13.83 EFPY, and would have reached two times this fluence at 26.8 EFPY. This withdrawal therefore meets the American Society for Testing and Materials (ASTM) E185-82 criterion that states that capsules may be removed when the capsule neutron fluence is between one and two times the limiting fluence calculated for the reactor vessel at the end of expected life. This removal and the change to the withdrawal schedule have been reviewed and approved as required by 10 CFR Part 50, Appendix H. Vessel neutron fluence is now confirmed by ex-vessel dosimetry.

The WCAP-16028 X-Capsule examination report projected neutron fluences to 54 EFPY, including effects of power rerate from 3411 to 3565 megawatt thermal (MWt), by methods consistent with Regulatory Guide (RG) 1.190, Revision 0, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." WCAP-16028 validated these projections by comparison of the measured Capsule X dosimetry reaction rates with expected rates from the calculated exposures and evaluated the uncertainties in these projections as recommended by RG 1.190. WCAP-16028 Section 6.0 and Appendix A also projected the displacement per atom (dpa) alternative measure of neutron embrittlement (energy-dependent displacements per iron atom) to 54 EFPY, using methods consistent with ASTM E853 and E693, in support of RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," embrittlement assessment methods using dpa. The measured exposure of these coupons is 3.49×10^{19} neutrons/cm^2, nearly equal to the 3.51×10^{19} now predicted for 54 EFPY (*i.e.*, for a 60-year life, including rerate). This 54 EFPY, 60-year projection of 3.51×10^{19} neutrons/cm^2 is only 12 percent more than the original design-basis 32 EFPY estimate of 3.14×10^{19} neutrons/cm^2.

The applicant evaluated the X coupon set in 2003. The WCAP-16028 analysis of the X vessel material coupons and the staff evaluation indicate more than adequate EOL USE and indicate that ART for the limiting material will remain modest and will permit adequate operating margins to P-T limits until the end of a 60-year period of extended operation, projecting evaluation of the acceptability of these parameters to the end of the period of extended operation with considerable margin. Aging management for fluence, USE, and ART therefore now consists of ex-vessel dosimetry and available reserve coupons stored in the spent fuel pool with exposures in excess of those expected for the vessel at the end of the period of extended operation if additional coupon tests are required. Additional vessel material is available if new coupons are needed. The validity of these parameters for the analyses that depend upon them therefore will be maintained and confirmed to the end of the period of extended operation.

4.2.1.2 Staff Evaluation

The staff reviewed LRA Section 4.2.1 to verify pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected 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 finds that the Reactor Vessel Surveillance Program is designed to monitor material property changes due to neutron irradiation. The surveillance program is also required pursuant to 10 CFR Part 50, Appendix H.

The staff noted that six surveillance capsules, named U, V, W, X, Y and Z, were placed in the WCGS reactor vessel. The U, Y, V, and X capsules were then removed and analyzed, in that specific order. Capsules W and Z were removed also and placed in storage in the spent fuel pool for possible use at a later time. Exposure of the capsules satisfies the ASTM E -185 requirements for the current license as well as during the period of extended operation. Analysis of the capsule dosimetry and conversion into projected vessel fluence values is performed in accordance with NRC-approved codes that in general adhere to staff guidance provided in RG 1.190. The staff finds that the calculation for the peak fluence at 60 years of operation takes into account a power uprate from 3411 MWt to 3565 MWt. The staff noted that conservatively, the period of extended operation was calculated at 90 percent load factor to 54 EFPYs of operation even though for the initial fuel cycles, the load factor was much lower than 90 percent. Surveillance capsule analysis and projection of vessel fluence to the end of the period of extended operation have been performed by Westinghouse Electric Company using staff-approved methodologies. Its topical report WCAP-16028, Revision 0, "Analysis of Capsule X from Wolf Creek Nuclear Operating Corporation, Wolf Creek Reactor Vessel Radiation Surveillance Program," dated March, 2003, includes the results of the dosimetry analysis, comparison of calculated to measured dosimeter activation for Capsule X, and the projected values of the peak vessel fluence to the end of license renewal (i.e., 60 years of operation).

Based on its review of this topical report, the staff finds that:

- Dosimetry indicated excellent agreement between calculated and measured values from surveillance Capsule X.

- The estimated (i.e., through the lead factor) measured value for the peak fluence is 3.49×10^{19} n/cm^2 (i.e., E greater than 1 MeV) compared to 3.51×10^{19} n/cm^2 from the calculation. This close agreement provides an additional assurance for the calculated value.

- The accepted value of the peak vessel fluence is 3.51×10^{19} n/cm^2.

The staff finds that by using RG 1.99, Revision 2, position 2.1, the maximum value for the limiting plate is 109 °F (270 ° F limit per 10 CFR 50.61). This is indicative of a large margin and the low state of embrittlement of the reactor vessel.

The staff's review of LRA Section 4.2.1 identified an area in which additional information was necessary to complete the review of the applicant's TLAA evaluation. The applicant responded to the staff's request for additional information (RAI) as discussed below.

In RAI 4.2.1-1 dated April 9, 2007, the staff requested that the applicant submits a table of the 60-year EOL USE values for each beltline material. In addition, the staff requested that the applicant discusses how surveillance results were evaluated in determining the USE values.

In its response dated May 9, 2007, the applicant provided discussion of the USE values for all the reactor pressure vessel beltline materials as a part of providing its evaluation in determining the USE values (documented in the applicant response to RAI 4.2.1-1). Based on its review, the staff finds that the applicant has demonstrated that all are above the 50 ft-lb acceptance criterion.

The staff finds the applicant's response to RAI 4.2.1-1 acceptable. The staff also noted that the vessel, primarily due to its chemical composition (i.e., low copper and nickel content), sustained very little embrittlement; consequently, it has generous operating margins to P-T curve limits for PTS and LTOP. Therefore, the staff's concern described in RAI 4.2.1-1 is resolved.

On the basis of its review, the staff finds that the analyses have been projected to the end of the period of extended operation and that the aging effects will be adequately managed.

4.2.1.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of neutron fluence, upper-shelf energy and adjusted reference temperature in LRA Section A3.1.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address neutron fluence, upper-shelf energy and adjusted reference temperature is adequate.

4.2.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for neutron fluence, upper-shelf energy and adjusted reference temperature, the analyses have been projected to the end of 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 also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.2 Pressurized Thermal Shock

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2 summarizes the evaluation of PTS for the period of extended operation. Section 54.4(a)(3) of the 10 CFR requires the applicant to evaluate all structures, systems, and components (SSCs) relied on in safety analyses or plant evaluations to perform functions for compliance with 10 CFR 50.61. If the RT_{PTS} for each heat of material of the reactor pressure vessel does not exceed 270 °F for plates, forgings, and axial welds or 300 °F for circumferential welds (the PTS screening criteria), only the reactor pressure vessel is "relied on to demonstrate compliance" with 10 CFR 50.61. The reactor pressure vessel meets the PTS screening criteria, will continue to meet them for the period of extended operation, and is therefore the only component relied upon to demonstrate compliance with 10 CFR 50.61. Section 50.61(b)(1) of 10 CFR requires a re-evaluation of RT_{PTS} whenever there is a significant change in projected RT_{PTS} values or upon a request for a change in the expiration date for operation of the facility.

License renewal therefore requires RT_{PTS} re-evaluation even if the expected change is not significant. The applicant will revise the P-T limits report (PTLR) for the period of extended operation and incorporate the RT_{PTS} projections reported in WCAP-16030 and summarized here, in accordance with 10 CFR 50.61(b)(1). The evaluation of the PTS screening parameter will be projected to the end of the period of extended operation.

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 analyses have been projected to the end of the period of extended operation.

The staff finds that 10 CFR 50.61 provides the fracture toughness requirements protecting reactor pressure vessels against the consequences of PTS, and the screening criteria against which the calculated values are to be evaluated. Reactor pressure vessel beltline base-metal materials (i.e., forging or plate materials) and longitudinal (i.e., axial) weld materials are considered to provide adequate protection against PTS events if the calculated RT_{PTS} values are less than or equal to 270 °F. Reactor pressure vessel beltline circumferential weld materials are considered to provide adequate protection against PTS events if the calculated RT_{PTS} values are less than or equal to 300 °F. The regulations also provide an expanded discussion regarding how the calculations of RT_{PTS} values should be performed and describe two methods for determining RT_{PTS} values for reactor vessel beltline materials, depending on whether or not a given reactor vessel beltline material is represented in the plant's surveillance program.

The staff noted that LRA Table 4.2-3 lists RT_{PTS} values for only the limiting reactor pressure vessel material.

The staff's review of LRA Section 4.2.2 identified an area in which additional information was necessary to complete the review of the applicant's TLAA evaluation. The applicant responded to the staff's RAI as discussed below.

In RAI 4.2.2-1 dated April 9, 2007, the staff requested that the applicant submit a table of the 60-year EOL RT_{PTS} values for each beltline material. In addition, the staff requested that the applicant discuss how surveillance capsule results were applied in the determination of the RT_{PTS} values.

In its response dated May 9, 2007, as a part of providing its discussion of evaluation in determining the RT_{PTS} values, the applicant provided the heat numbers, material ID, copper and nickel content, chemistry factor, initial RT_{NDT}, margin, 60-year peak fluence, fluence factor, ΔRT_{PTS}, and 60-year RT_{PTS} values for all materials included in the WCGS surveillance program. Based on its review, the staff finds that the applicant has calculated the PTS values for these materials in accordance with 10 CFR 50.61 for the period of extended operation.

The staff finds the applicant's response to RAI 4.2.2-1 acceptable. The staff finds that the applicant performed evaluations of all materials subject to the provision of 10 CFR Part 50, Appendix H, and that the limiting material specified in the LRA is bounding. Therefore, the staff's concern described in RAI 4.2.2-1 is resolved.

The staff verified the applicant's limiting 54 EFPY RT_{PTS} values and confirmed that the limiting material for PTS, lower shell plate R2508-3, has a predicted value of 109 °F using surveillance data. The staff notes that this value is less than the screening criteria of 270 °F for plates. Therefore, the staff concludes that the reactor vessel will meet the requirements of 10 CFR 50.61 during the period of extended operation and that the aging effects will be adequately managed.

4.2.2.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of PTS in LRA Section A3.1.2. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address PTS is adequate.

4.2.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for PTS, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.3 Pressure-Temperature Limits

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 summarizes the evaluation of P-T limits for the period of extended operation. P-T limit curves are operating limits, conditions of the operating license, and are included in the PTLR, as required by Technical Specifications. They are valid up to a stated vessel fluence limit and must be revised prior to operating beyond that limit. The currently-applicable PTLR is valid up to only 20 EFPY and is not based on the evaluation of the most recently withdrawn X-Coupon set. The analysis of the X vessel coupons indicates that the ART for the limiting material will remain modest and will permit adequate operating margins to P-T limits until the end of a 60-year period of extended operation. The applicant will revise the PTLR before reaching 20 EFPY and will project appropriate P-T limits to the end of the 60-year period.

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 analyses have been projected to the end of the period of extended operation.

The staff finds that 10 CFR 50.60 and 10 CFR Part 50, Appendix G establish the requirements and criteria for generating the P-T limits for commercial U.S. light-water reactors. The P-T limit curves that apply for the current operating conditions are included in the facility's PTLR. The P-T limit curves will continue to be updated as required by 10 CFR Part 50, Appendix G, or by operational needs. The staff finds that this will assure that the operational limits remain valid during the period of extended operation. Therefore, based on its review, the staff finds that the applicant's evaluation of P-T limits for the period of extended operation is acceptable pursuant to 10 CFR 54.21(c)(1)(ii).

The staff finds that the applicant's current PTLR is valid for up to 20 EFPY. The data from the analysis of surveillance Capsule X is not included in the current PTLR. The staff noted that by letter dated April 8, 2003, the applicant submitted its reactor pressure vessel surveillance capsule report for Capsule X. By letter dated December 13, 2003, the staff concluded that there will be no significant impact on P-T operating limits due to the Capsule X results.

In addition (additional measure of assurance), the applicant committed to revise the PTLR before reaching 20 EFPY and will, at that time, project appropriate P-T limits to the end of the period of extended operation. Therefore, the staff concludes that the applicant will continue to meet the requirements of 10 CFR 50.61 during the period of extended operation and that the aging effects will be adequately managed.

4.2.3.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of P-T limits in LRA Section A3.1.3. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address P-T limits is adequate.

4.2.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for P-T limits, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Low Temperature Overpressure Protection

4.2.4.1 Summary of Technical Information in the Application

LRA Section 4.2.4 summarizes the evaluation of LTOP for the period of extended operation. LTOP is required by Technical Specifications (Limited Condition for Operation 3.4.12) and provided (in part) by the COMS, which opens the power-operated relief valves at a setpoint determined by current P-T limits analysis. The calculation of the P-T limit curves depends on assumed neutron fluence at the end of the period to which the limits apply and is therefore a TLAA; however, once the P-T curves have been calculated, the subsequent calculation of the COMS setpoint is time-dependent only because it depends on the P-T limits. Other COMS setpoints and features are not time-dependent. The COMS setpoint is established in the PTLR, which will be revised for the period of extended operation.

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 analyses have been projected to the end of the period of extended operation.

The staff noted that LTOP limits are considered as part of the calculation of the P-T curves. The current P-T analyses are valid up to 20 EFPY. The P-T limit curves that apply for the current operating license are included in the PTLR for each plant. The P-T limit curves will be updated continuously as required by 10 CFR Part 50, Appendix G, or by operational needs. The staff finds that this updating will assure that the operational limits remain valid through the period of extended operation.

The staff noted that the data from the analysis of surveillance Capsule X is not included in the current PTLR. The staff noted that by letter dated April 8, 2003, the applicant submitted its reactor pressure vessel surveillance capsule report for Capsule X. By letter dated December 13, 2003, the NRC concluded that there will be no significant impact on P-T operating limits due to the Capsule X results. In addition (additional measure of assurance), the applicant committed (documented in Appendix A) to revise the PTLR before reaching 20 EFPY and will also, at that time, project appropriate P-T limits to the end of the period of extended operation.

On the basis of its review, the staff concludes that the applicant has a process for updating the plant's P-T curves and LTOP power-operated relief valve setpoints for the period of extended operation. Therefore, the staff finds that, the applicant's evaluation of LTOP for the period of extended operation satisfies the requirements of 10 CFR 54.21(c)(1)(ii) and 10 CFR Part 50, Appendices G and H.

4.2.4.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of LTOP in LRA Section A3.1.4. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address LTOP is adequate.

4.2.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that for LTOP, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3 Metal Fatigue Analysis

By letters dated June 1, August 9, and October 17, 2007, the applicant revised LRA Section 4.3. In these amendments, the applicant stated that the fatigue analyses are required for piping, vessels, and heat exchangers designed to American Society of Mechanical Engineers (ASME) "Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components," Division 1, "Metal Components," Subsection NB, "Requirements for Class 1 Components" (ASME Code Section III Class 1). Fatigue analyses may also be invoked for Class 1 pump and valve pressure boundaries. The design of piping and vessels to certain other codes and code sections, including ASME Code Section III Class 2 and 3, ANSI-ASME B31.1, and ASME Code Section VIII Division 2, may assume a stated number of full-range thermal and displacement cycles. Westinghouse license renewal topical report WCAP-14575-A, "Aging Management Evaluation for Class 1 Piping and Associated

Pressure Boundary Components," and the related NRC staff evaluation catalog aging effects and the Class 1 components affected by them, and propose dispositions for the period of extended operation that are consistent with the requirements of 10 CFR 54. This section supplies additional WCGS-specific information necessary for disposition of these TLAAs and describes fatigue analyses and evaluations of a limited number of other non-Class 1 components.

The applicant stated that ASME Code Section III Class 1 design specifications define a set of static and transient load conditions for which components are to be designed. Although original design specifications commonly state that the transient conditions are for a 40-year design life, the fatigue analyses themselves are based on the specified number of occurrences of each transient rather than on this lifetime. The number of occurrences of each transient for the WCGS fatigue analyses was specified to be somewhat larger than the number of occurrences expected during the 40-year license life of the plant, based on engineering experience and judgement. This provides a margin of safety and an allowance for future changes in design or operation that may affect system design transients. The applicant stated that operating experience at WCGS and at other similar units has demonstrated that the assumed frequencies of design transients, and therefore the number of transient cycles assumed for a 40-year life, were conservative.

4.3.1 Fatigue Management Program

LRA Section 4.3.1 states that in accordance with the Technical Specifications, the existing Metal Fatigue of Reactor Coolant Pressure Boundary Program uses cycle counting and usage factor tracking to ensure that actual plant experience remains bounded by design assumptions and calculations reflected in the USAR. It was customized, verified, and validated pursuant to a 10 CFR 50, Appendix B, quality assurance (QA) program for plant-specific implementation at WCGS. The applicant indicates that the program will be enhanced and augmented in order to support safe plant operation for the period of extended operation. The enhanced Metal Fatigue of Reactor Coolant Pressure Boundary Program will monitor plant transients and cumulative usage factors (CUFs) for a subset of ASME Code Section III Class 1 reactor coolant pressure boundary vessel and piping locations, to ensure that licensing basis limits on fatigue effects, in all locations, are not exceeded without being identified, and without appropriate corrective measures.

4.3.1.1 Present WCGS Fatigue Monitoring Program

4.3.1.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1.1 summarizes the evaluation of the existing Metal Fatigue of Reactor Coolant Pressure Boundary Program for the period of extended operation. The fatigue analyses incorporate several conservative assumptions and methods, described below, to ensure that usage factors predicted by the design calculation will exceed (or "bound") the usage factors actually accumulated by the components.

- Fatigue Design Curve with Margin for Uncertainties and Moderate Environmental Effects. The ASME Code Section III fatigue cyclical stress and cycles to failure curves (i.e., S-N curves) are based on regression analysis of a large number of fatigue data points for samples strain-cycled in air. The curves include adjustments for the elastic modulus and for departure from zero mean stress; and a margin for uncertainties, including modest environmental effects.

- Bounding Parameters for Transients. Fatigue analyses assume a given number of cycles of each transient of a set of transient events, where each event is defined by limiting pressure and temperature transients and other load conditions. Since actual event cycles are seldom as severe as those considered in the analysis, the resulting stress ranges are lower. Therefore, the contributions to cumulative usage factor are also lower.

- Actual Number of Event Cycles. The analytic limit for a fatigue analysis is a CUF of 1.0 at any location. The CUF is calculated as the sum of all contributing partial usage factors for the design basis number of each of the design basis cyclic loading events. Even if the analysis showed a calculated usage factor at the 1.0 limit for a location, and even if the design basis number of events were reached for one or more events of a set, but not for the remainder of the assumed events, some margin will remain to the 1.0 limit because not as many design basis events will have occurred as assumed by the analysis. Therefore they will not have contributed as much to the usage factor as the analysis assumed.

4.3.1.1.2 Staff Evaluation

LRA Section 4.3.1 describes the current fatigue monitoring program at WCGS and demonstrates how this program will continue to manage fatigue during the period of extended operation. During the audit, the staff requested that the applicant explain how the aging management program (AMP) tracks usage factors.

In its response, the applicant stated that the program uses both design basis cycle-based and stress-based monitoring. However, the applicant clarified that stress-based results are only used if they are required to demonstrate acceptable fatigue usage; otherwise, the cycle-based results are used. The staff also reviewed the applicant's basis documents which tracks current transient cycles. The staff's evaluation of the Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24.

On the basis that the applicant is committed (Commitment No. 21) to perform cycle monitoring and stress-based evaluations at selected locations, the staff finds the applicant's fatigue monitoring acceptable.

4.3.1.1.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of the Metal Fatigue of Reactor Coolant Pressure Boundary Program in LRA Section A3.2. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address the existing Metal Fatigue of Reactor Coolant Pressure Boundary Program is adequate.

4.3.1.1.4 Conclusion

On the basis of its review, the staff concludes that the Fatigue Monitoring Program provides an acceptable method to track the fatigue usage of selected reactor coolant system (RCS) components. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.2 Present Status of Monitored Locations

4.3.1.2.1 Summary of Technical Information in the Application

LRA Section 4.3.1.2 summarizes the evaluation of present status of monitored locations for the period of extended operation. The applicant stated that the Metal Fatigue of Reactor Coolant Pressure Boundary Program was implemented in 1997. The usage factors calculated by the program include the effects of cycles incurred before the program was installed. The cycle count input to the program was accumulated from two periods. Effects were counted or estimated from the WCGS operating history for the period between initial cold hydro in February 1982 to the installation of the automated transient data acquisition system in March 1992. Data from the data acquisition system and from operating records were used thereafter, up to the implementation of the Metal Fatigue of Reactor Coolant Pressure Boundary program.

The applicant stated that the cycle accumulations indicate that the original design basis number of events should not be reached in a 60-year operating life, nor should the cumulative usage factor limit of 1.0 be exceeded. WCGS operating changes have successfully mitigated surge line and pressurizer thermal stratification and insurge-outsurge transient effects, limiting the remaining causes of fatigue usage to counted transients. Cycle counting is therefore an effective means of determining the contribution of these effects to fatigue usage in these locations.

With the exception of one location that has been validated for a 60-year life, the Metal Fatigue of Reactor Coolant Pressure Boundary Program monitors all of the NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear power Plant Components," sample locations to be addressed at WCGS. The applicant stated that these locations were chosen to represent limiting usage factor locations in the Class 1 components and piping systems.

4.3.1.2.2 Staff Evaluation

During the audit, the staff reviewed the limiting locations tracked by the Metal Fatigue of Reactor Coolant Pressure Boundary Program as indicated in LRA Table 4.3-2. On the basis that the program monitors a sample of critical components, which include all of the locations identified in NUREG/CR-6260, the staff finds that the fatigue monitored locations are consistent with the recommendations provided in the SRP-LR.

4.3.1.2.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of present status of monitored locations in LRA Section A3.2. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address present status of monitored locations is adequate.

4.3.1.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant's monitored locations are consistent with recommendations in the SRP-LR. The staff concludes that these monitored locations are acceptable. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.3 Program Enhancements for the Period of Extended Operation

4.3.1.3.1 Summary of Technical Information in the Application

LRA Section 4.3.1.3 summarizes the evaluation of program enhancements for the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced by including additional components to be monitored and by incorporating additional action limits and corrective action administrative controls. Corrective actions of the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to ensure that on approach to an action limit, an evaluation determines whether the scope of the program must be enlarged to include additional affected reactor coolant pressure boundary locations; to ensure that other locations do not approach the code limit without an appropriate action, and that the bases of the LBB and high-energy line break (HELB) analyses are maintained.

These enhancements will be required to address fatigue TLAAs in the period of extended operation. The applicant therefore will complete these program enhancements before the end of the current licensed operating period. Changes in available monitoring technology or in the analyses themselves by that time may permit different action limits and action statements or may re-define the program features and actions required to address the fatigue TLAAs.

4.3.1.3.2 Staff Evaluation

During the audit, the staff reviewed the enhanced corrective action limits described in LRA Section 4.3.1.3. The staff requested that the applicant explain if there will be sufficient time to take appropriate and timely corrective actions if the periodic evaluation prescribed by the Metal Fatigue of Reactor Coolant Pressure Boundary Program indicates that the CUF limit might be exceeded in the next operating cycle. The staff also asked that the applicant clarify what are the definitions of the CUF limits for initiating corrective actions.

In its response, the applicant noted that allowing sufficient time for corrective action is a criterion for these action limits. The applicant stated that the action limits are under development for the period of extended operation, and that the time constraints and their bases cannot be described in detail in advance of these action limits. The applicant further stated that LRA Section 4.3.1.3 has been amended to describe the basis for these action limits, including time constraints. The Metal Fatigue of Reactor Coolant Pressure Boundary Program provides for periodic evaluation (i.e., once per operating cycle) of fatigue usage and cycle count tracking of critical thermal and pressure transients to verify that the ASME Code CUF limit of 1.0 and other CUF design limits (i.e., the HELB criteria of CUF less than 1.0) will not be exceeded. The applicant also stated that the program will be enhanced to specify acceptable corrective actions to be implemented to ensure that design limits are not exceeded. These enhancements will include action limits for accrued transient cycles or CUF that require initiation of corrective actions, allowing sufficient time to effectively address the issues.

By letter dated June 1, 2007, the applicant amended LRA Section 4.3.1.3 to include these changes. In addition, by letter dated August 20, 2007, the applicant committed (Commitment No. 21) to address the enhancement of the Metal Fatigue of Reactor Coolant Pressure Boundary Program. This commitment was subsequently modified by letter dated October 3, 2007, to state:

> Prior to the period of extended operation, the Metal Fatigue of Reactor Coolant Pressure Boundary Program will be enhanced to include:
>
> (1) <u>Cycle Count Action Limit and Corrective Actions</u>. An action limit will be established that requires corrective action when the cycle count for any of the critical thermal and pressure transients is projected to reach a high percentage (e.g., 90%) of the design specified number of cycles before the end of the next fuel cycle. If this action limit is reached, acceptable corrective actions include:
>
> (a) Review of fatigue usage calculations:
>
> I. to determine whether the transient in question contributes significantly to CUF,
>
> ii. to identify the components and analyses affected by the transient in question, and
>
> iii. to ensure that the analytical bases of the leak-before-break (LBB) fatigue crack propagation analysis and of the high-energy line break (HELB) locations are maintained.
>
> (b) Evaluation of remaining margins on CUF based on cycle-based or stress-based CUF calculations using the WCGS fatigue management program software.
>
> (c) Redefinition of the specified number of cycles (e.g., by reducing specified numbers of cycles for other transients and using the margin to increase the allowed number of cycles for the transient that is approaching its specified number of cycles).

(2) Cumulative Fatigue Usage Action Limit and Corrective Actions. An action limit will be established that requires corrective action when calculated CUF (from cycle based or stress based monitoring) for any monitored location is projected to reach 1.0 within the next 2 or 3 fuel cycles. If this action limit is reached, acceptable corrective actions include:

(a) Determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations. This determination will ensure that other locations do not approach design limits without an appropriate action.

(b) Enhance fatigue monitoring to confirm continued conformance to the code limit

(c) Repair the component

(d) Replace the component

(e) Perform a more rigorous analysis of the component to demonstrate that the design code limit will not be exceeded

(f) Modify plant operating practices to reduce the fatigue usage accumulation rate

(g) Perform a flaw tolerance evaluation and impose component-specific inspections, under ASME Code Section XI Appendices A or C (or their successors), and obtain required approvals by the NRC.

Corrective action limits for cumulative fatigue usage will be established to assure that sufficient margin is maintained to allow one cycle of the highest fatigue usage per cycle transient to occur without exceeding CUF = 1.0. (This includes consideration of environmental effects for NUREG/CR-6260 locations.) This may require that corrective action is taken more than 2 or 3 fuel cycles before CUF is projected to exceed 1.0. This is because the projections will be based on historical experience, which is not expected to include many of the low probability design transients. The low probability design transients to be used in the evaluation will include:

- auxiliary spray actuation, spray water diff. greater than 320 °F
- excessive feedwater flow
- reactor trip - cooldown with no SI
- COMS

- reactor trip - no inadvertent cooldown with turbine over-speed
- reactor trip - cooldown with SI
- inadvertent RCS depressurization
- accumulator safety injection
- operating basis earthquake

(3) 10 CFR 50, Appendix B, procedural and record requirements. Prior to the period of extended operation, changes in available monitoring technology or in the analyses themselves may permit different action limits and action statements, or may re-define the program features and actions required to address fatigue time-limited aging analyses (TLAAs).

The staff reviewed the applicant's commitment and finds that it addresses all the concerns raised by the staff. Based on its review, the staff concludes that the Metal Fatigue of Reactor Coolant Pressure Boundary Program is an acceptable program to manage the fatigue usage of the monitored components during the period of extended operation in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

4.3.1.3.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of program enhancements as described in Commitment No. 21, for the period of extended operation in LRA Section A3.2. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address program enhancements for the period of extended operation is adequate.

4.3.1.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant demonstrated that the Metal Fatigue of Reactor Coolant Pressure Boundary Program will adequately manage the effects of fatigue. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 ASME Code Section III Class 1 Fatigue Analysis of Vessels, Piping, and Components

Fatigue analyses are performed for ASME Code Section III, Division 1, Class 1 piping, vessels, heat exchangers, pumps, and valves; and if applicable, their supports. The reactor vessel internals are not designed to ASME Code Section III Class 1 but are analyzed to ASME Code Section III Subsection NG.

4.3.2.1 Reactor Pressure Vessel, Nozzles, Head, and Studs

4.3.2.1.1 Summary of Technical Information in the Application

LRA Section 4.3.2.1 summarizes the evaluation of reactor pressure vessel, nozzles, head, and studs for the period of extended operation. The reactor pressure vessel is designed to the ASME Code Section III, Subsection NB (Class 1), 1971 Edition with Addenda through Winter 1972. Pressure-retaining and support components of the reactor pressure vessel are subject to an ASME Boiler and Pressure Vessel Code, Division 1, Section III, fatigue analysis which has been updated to incorporate redefinitions of loads and design-basis events (DBEs), operating changes, power rerate, and minor modifications. The currently applicable fatigue analyses of these components are TLAAs.

The limiting components for fatigue in the reactor pressure vessel pressure boundary and its supports are the bottom-mounted instrument tubes and the inlet and outlet nozzles. The design-basis CUFs in these components do not exceed 0.4. Other components of the reactor pressure vessel pressure boundary and its supports are affected by similar loads and transients. The closure flanges, studs, and nuts are also subject to bolt-up cycles; however, the maximum 40-year usage factor in the head and flanges is only about 0.08, including the COMS transient allowance. The maximum 40-year usage factor in the studs, including effects of an increased elongation tolerance and the conservative COMS transient allowance, is 0.672. The reactor vessel primary coolant inlet and outlet nozzles and lower head-to-shell juncture are evaluated consistently with NUREG/CR-6260, for effects of the reactor coolant environment on fatigue behavior of these materials.

The applicant stated that fatigue usage factors in the reactor vessel pressure boundary depend not on effects time-dependent at steady-state conditions, but only on effects of operational, abnormal, and upset transient events, principally on startup and shutdown transients and on head flange bolt-up. The existing reactor vessel fatigue analyses therefore will remain valid for the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure that the fatigue analyses remain valid or that appropriate reevaluation or other corrective measures maintain the design and licensing basis. The applicant stated that fatigue effects in the reactor pressure vessel pressure boundary and its supports will be so managed for the period of extended operation.

4.3.2.1.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.1 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.

During the audit, the staff reviewed the reactor pressure vessel report, including its CUF results, and confirmed that the maximum design CUF for the reactor pressure vessel studs is 0.672. The staff also reviewed LRA Table 4.3-1 that lists the design transient cycles and transient cycles for the last 20 years of operation. The 60-year transient cycles could be conservatively determined by adding the design transient cycles and transient cycles up to the end of 2005. The staff determined that a conservative factor of 1.3 could be used to multiply by the current maximum design CUF of 0.672 to get a value of 0.874.

On the basis of the above evaluation, the staff concludes that the CUFs will remain below 1.0 during the period of extended operation. In addition, as required by 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in the reactor pressure vessel pressure boundary components and studs during the period of extended operation. The staff's evaluation of the Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. On this basis, the staff concludes that the applicant's aging management is consistent with the recommendations of the SRP-LR.

4.3.2.1.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA aging management of reactor pressure vessel, nozzles, head, and studs in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address reactor pressure vessel, nozzles, head, and studs is adequate.

4.3.2.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for reactor pressure vessel, nozzles, head, and studs, 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.2 Control Rod Drive Mechanism Pressure Housings, Adapter Plugs, and Canopy Seals

4.3.2.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2.2 summarizes the evaluation of control rod drive mechanism (CRDM) pressure housings, adapter plugs, and canopy seals for the period of extended operation. The applicant stated that the CRDM housings are designed to the ASME Code Section III, Subsection NB (Class 1), 1974 Edition with Addenda through Winter 1974. The CRDM pressure housings, adapter plugs, and the added canopy seal clamp assemblies are ASME Code Section III Class 1 components with a Class 1 fatigue analysis. The analysis was reexamined for the power rerate and T_{hot} reduction modification, for 10 percent of steam generator tubes plugging, and for addition of canopy seal clamp assemblies. The maximum calculated usage factor in the CRDM pressure housings indicates design adequacy for nine times the number of specified design transient events. The evaluation of fatigue effects in the CRDM pressure housings will therefore remain valid for the period of extended operation.

4.3.2.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.2 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, the staff reviewed the ASME Code analysis and confirmed that the maximum usage factor at the worst-case CRDM housing-to-head weld is 0.1093. The staff agrees that the maximum usage factor of 0.1093 indicates that the design is adequate for nine times the number of specified design transient events.

Based on its review, the staff concludes that the fatigue effects in the CRDM housing will remain below 1.0 during the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.3.2.2.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of CRDM pressure housings, adapter plugs, and canopy seals in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address CRDM pressure housings, adapter plugs, and canopy seals is adequate.

4.3.2.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for CRDM pressure housings, adapter plugs, and canopy seals, the analyses remain valid for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.3 Reactor Coolant Pump Pressure Boundary Components

4.3.2.3.1 Summary of Technical Information in the Application

LRA Section 4.3.2.3 summarizes the evaluation of reactor coolant pump (RCP) pressure boundary components for the period of extended operation. The applicant stated that the pump pressure boundary was designed to ASME Code Section III, 1972 Edition with Addenda through Summer 1973. It stated that conservative, simplified fatigue analyses for a number of components and subsequent load definition changes eventually resulted in fatigue waivers or analyses in a number of additional locations in the pump pressure boundary. These fatigue and fatigue waiver analyses have been updated to redefine loads and DBEs, operating changes, power rerate, and minor modifications. The fatigue analyses are TLAAs. The fatigue waiver analyses are also TLAAs because they depend in part on the assumed numbers of design-basis normal and upset transient cycles.

The applicant stated that fatigue usage factors in the RCPs do not depend on time-dependent effects at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events, principally on startup and shutdown transients. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events to ensure either that the code design values remain valid or that appropriate reevaluation or other corrective action is taken if a design-basis number of events is exceeded or if usage factors approach the limit of 1.0. Effects of fatigue in the RCP boundaries will be so managed for the period of extended operation.

4.3.2.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.3 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.

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in RCP pressure boundary components during the period of extended operation. The applicant indicated that the original evaluation of the pump pressure boundary demonstrated that the ASME Code fatigue exemption rules were satisfied. The applicant also indicated that fatigue analyses were performed for several pump components. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events used for these evaluations to ensure: (1) that the operating cycles of the events remains within the cycles of design allowable events, or (2) that appropriate reevaluation or other corrective action is taken if a design-basis number of events is exceeded or if usage factors approach the limit of 1.0. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations in the SRP-LR.

4.3.2.3.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA aging management of RCP pressure boundary components in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address RCP pressure boundary components is adequate.

4.3.2.3.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for RCP pressure boundary components, the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.4 Pressurizer and Pressurizer Nozzles

4.3.2.4.1 Summary of Technical Information in the Application

LRA Section 4.3.2.4 summarizes the evaluation of pressurizer and pressurizer nozzles for the period of extended operation. The applicant stated that pressure-retaining and support components of the pressurizer are subject to an ASME Code, Division 1, Section III, fatigue analysis. This analysis has been updated from time to time to incorporate redefinitions of loads and DBEs, operating changes, power rerate, and minor modifications; including the effects of thermal stratification and insurge-outsurge transients which were not included in the original analyses.

The LRA states that with the design basis set of transients, including the power rerate and T_{hot} modifications, the worst-case fatigue usage factors for the present design exceed 0.9 at three pressurizer locations. Although the pressurizer surge nozzle, spray nozzle, and lower head are subject to significant operating thermal cycles from thermal stratification and insurge-outsurge transients not considered in the original code analysis, operating procedure changes have minimized these transients. Updated analyses confirm that fatigue usage factors in the affected pressurizer components will be within acceptable limits for the originally-specified design transient events, plus the number of these additional transient events expected for an operating life of 60 years.

The LRA states that the Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events to ensure either that the number of assumed events are sufficient and the usage factors are not exceeded, or that appropriate reevaluation or other corrective measures maintain the design and licensing basis. The pressurizer surge nozzle, spray nozzle, and lower head may be subject to significant operating thermal stress cycles due to thermal stratification and insurge-outsurge cycles and therefore are expected to be the limiting pressurizer components for fatigue. The fatigue usage factors of these locations therefore are specifically monitored. The applicant stated that the effects of fatigue in the pressurizer Class 1 pressure boundary and supports will thereby be managed for the period of extended operation.

4.3.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.4 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.

During the audit, the staff requested that the applicant discuss the fatigue impact on the pressurizer nozzles due to the application of weld overlays in 2006.

In its response dated July 26, 2007, the applicant stated:

> A weld overlay was installed over the surge-nozzle-to-safe-end weld, safe end, and safe-end-to-pipe weld during Refuel 15. The overlay extends beyond the nozzle-to-safe-end weld toward the pressurizer until it blends into the tapered thickness transition of the nozzle. The overlay extends beyond the safe-end-to-pipe weld onto the pipe for a distance of several pipe wall thicknesses. Therefore, the ends of the overlay are sufficiently far from the original welds to be unaffected by the stress intensification of the weld. The fatigue usage factors of the nozzle-to-safe-end and safe-end-to-pipe welds are no longer the basis of a safety determination, because the reliability of these welds will be verified by periodic inspections and by flaw propagation analyses that are not TLAAs.
>
> The maximum fatigue usage in the surge nozzle is at a location inside the nozzle inner radius. The overlay did not require a revision to the fatigue analysis at this location. The fatigue analysis of this location remains a TLAA, and fatigue in this location will continue to be monitored.

The staff finds that the above evaluations for fatigue analysis are not adequate. During the audit, the staff requested that the applicant explain why this analysis is not considered a TLAA. The staff requested that the applicant provides its regulatory basis.

In its response dated October 17, 2007, the applicant stated:

> The basis for the determination that the flaw propagation analyses are not TLAAs is that these analyses do not meet the definition of a TLAA in 10 CFR 54.3. Specifically, these analyses do not "involve time-limited assumptions defined by the current operating term, for example 40 years." The weld overlays are examined as part of the in-service inspection program. The flaw propagation analyses are performed to support in-service inspection frequencies and are based on the terms between inspections, not on the reactor operating life.

On the basis that these analyses are not time-limited, the staff finds the applicant's response acceptable. The staff agrees with the applicant that this is not a TLAA.

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in pressurizer Class 1 pressure boundary components during the period of extended operation. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events to ensure (1) that the operating cycles of the events remains within the cycles of design allowable events, or (2) that appropriate reevaluation or other corrective action is taken if a design-basis number of events is exceeded, or if usage factors approach the limit of 1.0. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations of the SRP-LR.

4.3.2.4.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA aging management of pressurizer and pressurizer nozzles in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address pressurizer and pressurizer nozzles is adequate.

4.3.2.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for pressurizer and pressurizer nozzles, 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.5 Steam Generator ASME Code Section III Class 1, Class 2 Secondary Side, and Feedwater Nozzle Fatigue Analyses

4.3.2.5.1 Summary of Technical Information in the Application

LRA Section 4.3.2.5 summarizes the evaluation of steam generator ASME Code Section III Class 1, Class 2 secondary side, and feedwater nozzle fatigue analyses for the period of extended operation. The steam generators are designed to the ASME Code Section III, Subsection NB (Class 1) and Subsection NC (Class 2), 1971 Edition with Addenda through Summer 1973. Pressure-retaining and support components of the primary coolant side of the steam generators are subject to an ASME Boiler and Pressure Vessel Code, Division 1, Section III fatigue analysis. Although the secondary side is Class 2, pressure-retaining parts of the steam generator satisfy the Class 1 criteria, including the Class 2 secondary side boundaries. These analyses have been updated to redefine loads and DBEs, operating changes, power rerate, primary loop T_{hot} reduction, and minor modifications.

The LRA states that fatigue usage factors in other steam generator pressure boundary and Class 1 support components and qualification of the primary manway studs by test do not depend on time-dependent effects at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. Appropriate corrective measures, which may include requalification or replacement, will ensure that the design basis of the bolting is maintained if fatigue monitoring indicates that the numbers of load cycles assumed by the qualification by test may be exceeded. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events to ensure that appropriate reevaluation or other corrective action is taken if a design-basis number of events is exceeded. This program will maintain a record of CUF for each monitored location. The applicant stated that effects of fatigue in the steam generator pressure boundaries and their supports will be so managed for the period of extended operation.

4.3.2.5.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.5 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 steam generator tube degradation mechanisms related to aging effects were not anticipated in the original design. The steam generator tube integrity now depends on managing aging effects by using the Steam Generator Tube Integrity Program. The staff's evaluation of this program is documented in SER Section 3.0.3.2.8.

LRA Table 4.3-2 states that the steam generator feedwater nozzles are tracked with stress-based monitoring. During the audit, the staff reviewed basis documents that indicate that actual plant transient data was used for the fatigue usage factor calculation for Period 2 (i.e., from 1996 through 2005), and that these CUF values were used to derive backward projected initial CUFs for Period 1 (i.e., from 1984 through 1995). During the audit, the staff requested the applicant to justify its backward-projected methodology.

In its response the applicant stated that fatigue usage for steam generator feedwater nozzles is principally accumulated during heatup and cooldown. The applicant concluded that fatigue usage for the initial period can be reasonably estimated by multiplying the usage accumulated during the monitored period by the ratio of heatup and cooldown events for these two periods.

The staff reviewed the applicant's response and requested the applicant to provide additional information.

In RAI 4.3-3 dated July 24, 2007, the staff requested that the applicant further justify the validity of these CUF backward-projections using the ratio of heatup and cooldown cycles. The staff noted that the projections were based solely on the ratio of heatup and cooldown cycles for most locations; however, it did not consider other significant transients. For example, the transient tracking report indicated that seven loss of offsite power cycles and two loss of load cycles occurred between 1984 and March 1992, and that these transients did not occur between March 1992 and December 2005.

In its response dated August 20, 2007, the applicant stated that it considered its original backward projected methodology are still valid. The staff reviewed the applicant's response and determined that additional information was necessary.

By letter dated September 4, 2007, the staff noted that a loss of offsite power and loss of load transient may cause the feedwater temperature to drop significantly. On this basis, the staff believes that the validity of the feedwater nozzles CUFs backward projections using the ratio of heatup and cooldown events may not be conservative. The staff requested that the applicant address this issue.

In its response dated October 3, 2007, the applicant stated:

> The RAI identifies two transients that are not accounted for when using the back-projection approach. The transient tracking report indicates that seven loss of offsite power cycles and two loss of load cycles occurred between 1984 and March 1992, and that these two transients did not occur again between March 1992 and December 2005. While those events are present in the cycle counts in LRA Table 4.3-1, the transients that actually occurred were not as severe as the design transients as specified in the Westinghouse Systems Standard Design Criteria 1.3F. Review of operator logs has verified that none of those transients need have been counted.
>
> The counted events did not include any auxiliary feedwater actuation, therefore these events were no more serious than a normal reactor trip. (Note that all 3 events, which included a reactor trip, were also counted as Reactor Trips.)

The staff reviewed the Westinghouse System Standard Design Criteria 1.3F, which defines the design transients, to confirm if loss of load and loss of power conservatively assumed auxiliary feedwater initiation could cause the feedwater temperature to drop approximately 400 °F. On the basis that actual auxiliary feedwater actuation has not occurred for those events during plant operation, the staff concludes that the fatigue evaluation does not have to address the original design conservatism based on the assumption specified in the Design Criteria 1.3F. The staff's concern related to the feedwater nozzles CUFs backward projections is resolved.

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in steam generator pressure boundary components, other than steam generator tubes, during the period of extended operation. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations in the SRP-LR.

4.3.2.5.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA aging management of steam generator ASME Code Section III Class 1, Class 2 secondary side, and feedwater nozzle fatigue analyses in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address steam generator ASME Code Section III Class 1, Class 2 secondary side, and feedwater nozzle fatigue analyses is adequate.

4.3.2.5.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for steam generator ASME Code Section III Class 1, Class 2 Secondary side, and feedwater nozzle fatigue analyses, 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.6 ASME Code Section III Class 1 Valves

4.3.2.6.1 Summary of Technical Information in the Application

LRA Section 4.3.2.6 summarizes the evaluation of ASME Code Section III Class 1 valves for the period of extended operation. Class 1 valves are designed to the ASME Code Section III, Subsection NB, 1974 Edition and later addenda.

The LRA states that the calculated worst-case usage factors for Class 1 pressurizer safety valves and for 6 inch swing check valves indicate that the designs have large margins and therefore that the pressure boundaries would withstand fatigue effects for at least two of the original design lifetimes. The design of these valves for fatigue effects is therefore valid for the period of extended operation.

The LRA states that the calculated worst-case usage factors for the Class 1 residual heat removal (RHR) 12 inch suction gate valves and the 10 inch check valves exceed 0.4; however, fatigue usage factors in these valves do not depend on time-dependent effects at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. The applicant stated that the 40-year design-basis number of events should be sufficient for 60 years of operation of Class 1 piping containing valves. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure that calculated usage factors will not be exceeded, or that appropriate corrective action is taken if a design-basis number of events is exceeded. Effects of fatigue in Class 1 valve pressure boundaries will thereby be managed for the period of extended operation.

4.3.2.6.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.6 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.

During the audit, the staff reviewed the applicant's basis documents which include Westinghouse valve design specifications, stress report for Westinghouse ASME Code Class 1 6-inch and larger swing check valves, and stress report for pressurizer safety valves. On the basis of its review, the staff finds that the designs have large margins to cover more than twice of the original design lifetime for the pressurizer safety valves and Class 1, 6-inch swing check valves. Therefore, the staff finds the design of these valves for fatigue effects is valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue for Class 1, 12-inch RHR suction gate valves and Class 1, 10-inch gate valves during the period of extended operation. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations of the SRP-LR.

4.3.2.6.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of ASME Code Section III Class 1 valves in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address ASME Code Section III Class 1 valves is adequate.

4.3.2.6.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for ASME Code Section III Class 1 valves, 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 concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.7 ASME Code Section III Class 1 Piping and Piping Nozzles

4.3.2.7.1 Summary of Technical Information in the Application

LRA Section 4.3.2.7 summarizes the evaluation of ASME Code Section III Class 1 piping and piping nozzles for the period of extended operation. Class 1 reactor coolant main-loop piping was supplied by Westinghouse, which designed it to the ASME Code Section III, Subsection NB, 1974 Edition with Addenda through Winter 1975. The main loop piping fatigue analysis was performed to the 1974 Edition with Addenda through Winter 1975. The fatigue analyses of piping outside the main loop used code Addenda through Summer 1979. These analyses have been updated from time to time to redefine loads and DBEs, operating changes, power rerate, and minor modifications. The currently applicable fatigue analyses of these components are TLAAs.

The LRA states that with the exception of the thermowells, surge line nozzles, and the pressurizer surge line, usage factors in Class 1 piping pressure boundaries do not depend on time-dependent effects at steady-state conditions, but depend only on effects of operational, abnormal, and upset transient events. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure either that the original design basis number of events or usage factor is not exceeded or that appropriate reevaluation or other corrective action is taken. Effects of fatigue in the Class 1 piping pressure boundary will thereby be managed for the period of extended operation.

4.3.2.7.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.7 to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation or, 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.

During the audit, the staff reviewed the applicant's stress analysis design report for the RCS thermowells and crossover leg nozzle cap to confirm that the maximum usage factor is 0.025. The staff agrees with the applicant's assessment that the thermowells cumulative fatigue usage factor for 60 years will remain negligible (10 CFR 54.21(c)(1)(i)).

As discussed in SER Section 4.3.2.5.2, during the audit, the staff requested that the applicant justify the methodology used for estimating fatigue usage prior to the implementation of the monitoring program. The applicant responded that the severities of the transients during the monitored period are typical of the period before monitoring was implemented. The staff reviewed the response and requested the applicant to provide additional information.

During the audit, the staff reviewed a surge line stratification evaluation report that indicates there are 26,000 piping insurge and outsurge cycles for 200 heatups and cooldowns that should be considered, if a modified operating procedure (relative to NRC bulletin 88-11 documented in SER Section 4.3.2.8) is not implemented. In RAI 4.3-3 dated July 24, 2007, the staff requested that the applicant further justify the validity of these CUF backward-projections using the ratio of heatup and cooldown cycles. During the audit, the applicant stated that WCGS had implemented a modified operating procedure prior to 1995 to mitigate piping insurge and outsurge transients. However, the staff reviewed the CUF calculation in the basis document supporting the LRA and found that the analyses that used actual transient data for Period 2 does not consider significant piping insurge and outsurge cycles from Period 1 to support the validity of the backward projections.

In its response to RAI 4.3-3 dated August 20, 2007, the applicant stated, in part:

> For the Group 2 pressurizer locations, the current backward projection to establish baseline fatigue usage may not be conservative. Following a review of the method used to develop backward projection of accumulated fatigue usage during plant operation in Period 1, it is concluded that data collected for transients affecting the hot leg surge line nozzle (HL surge nozzle) during Period 2 may not be bounding for transients experienced by this nozzle during Period 1. Therefore, the baseline Period 1 fatigue usage for HL surge nozzle calculated by using the ratio of Period 1 heatup/cooldown events to Period 2 heatup/cooldown events

times the fatigue usage for Period 2 determined by the stress based monitoring program may not be conservative.

A conservative baseline fatigue usage for Period 1 will be calculated using the method of cycle based fatigue usage calculations. Fatigue usage by this method is calculated from the actual plant transients counted during the period of interest and the design basis transient severity assumption. For the HL surge nozzle, the design basis transient severity is defined in WCAP-12893, "Structural Evaluation

of the Wolf Creek and Callaway Pressurizer Surge Lines, Considering the effects of Thermal Stratification."

WCAP-12893 postulates that each heatup and cooldown evolution includes a large number of sub-transients (from insurge/outsurge). The fatigue usage for a heatup/cooldown is a summation of the usage from the postulated insurge/outsurge sub-transients combined with the fatigue usage from the system temperature and pressure changes.

The baseline fatigue usage for the HL surge nozzle accumulated prior to implementation of the stress based fatigue monitoring data acquisition system will be recalculated using the conservative assumption that the transients that occurred during the un-monitored period (Period 1) were as severe as the design basis assumptions. The same methodology will be used for other pressurizer locations tracked by stress based monitoring unless there is a basis for assuming that the monitored period (Period 2) is typical of the un-monitored period (Period 1) for a specific locations.

In its response dated August 20, 2007, the applicant also stated that the charging and alternate charging nozzles are locations in the stress-based fatigue monitoring program that are evaluated for environmental effects in accordance with NUREG/CR-6260. It also stated that the Period 2 transients for these components are typical of the Period 1 transients.

The staff reviewed the applicant's response and determined that additional information was necessary.

As documented in the teleconference summary dated September 4, 2007, the staff noted that the applicant's backward projection ignored severity of transients by using only the cycles ratio. For example, a loss of charging water will cause three different types of transients. The loss of charging and prompt return to service does not contribute to a significant temperature change (around 50 °F). However, the loss of charging and delayed return to service has a significant temperature step change (about 500 °F). The staff stated that it does not agree with the applicant's method of combining different types of transients and using that ratio to determine the baseline usage factor. The staff finds that the validity of charging and alternate charging nozzles CUFs backward projections using the ratio of heatup and cooldown events may not be conservative. The staff requested that the applicant address this issue.

In its response dated October 3, 2007, the applicant committed (Commitment No. 38) to address backward projections for the surge line hot leg nozzle, charging nozzle and alternate charging nozzle. The applicant committed to calculate an updated baseline fatigue usage factor that adequately bounds transients experienced before the monitoring of CUFs was started. The applicant stated that the existing baseline CUF for all monitored locations will be increased to bound the potential CUF contribution from the transients that were under-represented in the existing baseline CUF.

The staff requested that the applicant submit this reanalysis to the staff for review by January 31, 2008. This was identified as open item (OI) 4.3-3.

By letter dated January 25, 2008, the applicant provided its first response to OI 4.3-3. The staff reviewed the applicant's methodology on the CUF reanalyses for the pressurizer spray nozzle, pressurizer lower head and heater penetration, pressurizer surge nozzle, surge line piping, steam generator feedwater nozzles, surge line hot leg nozzle, charging nozzles, and alternate charging nozzles. In its response, the applicant stated that its methodology will include identifying the transients count for Period 1 by incorporating a review of transient records to account for any improperly counted events being assumed and then computing a bounding CUF increment with the information gathered to update the baseline analysis. The staff found the methodology and process for performing a revised CUF analysis of pressurizer spray nozzle, pressurizer lower head and heater penetration, pressurizer surge nozzle, surge line piping and steam generator feedwater nozzles to be acceptable because: (a) the applicant's methodology and process will appropriately account for transients that occurred in Period 1 (i.e., revising the counted events being assumed, as appropriate, including those transients that were not accounted for and those transients whose cycles were improperly counted) and (b) the applicant appropriately computed the revised baseline CUFs for these components based on the updated transient information. In addition, in LRA Section 4.3.2.7, the applicant states that the impacts of metal fatigue on the intended functions of the Class 1 reactor coolant pressure boundary will be managed for the period of extended operation (i.e., the Metal Fatigue of the Reactor Coolant Pressure Boundary Program will ensure the number of cycles for design basis transients will be tracked and monitored against their allowable values). Based on this review, the staff concludes that the aging management of metal fatigue of the pressurizer spray nozzle, pressurizer lower head and heater penetration, pressurizer surge nozzle, surge line piping and steam generator feedwater nozzles is acceptable because the applicant will manage the effects of aging in accordance with the requirement in 10 CFR 54.21(c)(1)(iii). For the same reason, the staff also considers Commitment No. 38 to be fulfilled with respect to the CUF analyses for pressurizer spray nozzle, pressurizer lower head and heater penetration, pressurizer surge nozzle, surge line piping and steam generator feedwater nozzles.

The staff determined it needed additional information on the applicant's reanalyses for the surge line hot leg nozzle and charging nozzles because in its reassessment, the applicant did not account for: (a) the additional insurge/outsurge cycles from the pre-MOP environment and (b) the differential contribution from each category of charging events. The staff issued a follow-up RAI in a letter dated February 28, 2008, requesting that the applicant provides the information described above in order for the staff to complete its review.

By letter dated May 15, 2008, the applicant provided its second response to OI 4.3-3. The staff determined that the applicant's response did not provide the updated baseline CUF calculation for surge line hot leg nozzle and charging nozzles which were to account for the pre-MOP conditions and the differential contribution of fatigue for each charging event. The applicant supplemented this second response by letter dated June 9, 2008 and committed (Commitment No.41) as part of its Metal Fatigue of the Reactor Coolant Pressure Boundary Program, to prepare an updated baseline calculation for the surge line hot leg surge nozzle based on the actual pre-MOP environment for the nozzle and an updated baseline calculation for the charging nozzles based on the consideration for the differential contribution from each category of charging events. The applicant indicated that Commitment No. 41 closes and replaces Commitment No. 38 with respect to the reanalyses for the surge line hot leg nozzles and the charging nozzles. The staff finds this to be an acceptable basis for managing the impacts of metal fatigue on the pressure boundary function of the charging nozzles and surge line hot leg nozzle because: (a) for performance of periodic CUF updates, the applicant's commitment to do the updated baseline CUF calculations for these components and (b) the applicant has brought Commitment No. 41 within the scope of its existing Metal Fatigue of Reactor Coolant Pressure Boundary AMP to manage the aging effect on the components. Based on this review, the staff finds that the applicant has provided an acceptable basis for accepting the aging management of metal fatigue of the charging nozzles and surge line hot leg nozzle in accordance with the requirement in 10 CFR 54.21(c)(1)(iii).

Relative to the closure of commitment No. 38, in its review of this TLAA as it relates to the assessment of the charging nozzles, the staff noted that the applicant's current CUF analyses for the charging nozzles are based on the assumption that the charging nozzles are designed with thermal sleeves, which are used to mitigate the consequences of thermal cycling on the nozzles. The staff noted that in the applicant's response letter of May 15, 2008, the applicant indicated that it could not currently perform a revised baseline analysis for charging nozzles due to "conflicting and inconclusive" documentation on whether the charging nozzle were designed with thermal sleeves. To address this issue, the applicant supplemented its response letter of May 15, 2008, with a letter dated June 9, 2008. In the letter of June 9, 2008, the applicant committed to (Commitment No. 40): (a) confirm that either the design of the charging nozzles includes thermal sleeves or if not, (b) account for the lack of thermal sleeves in the reanalysis of the charging nozzles. The applicant indicated that Commitment No. 40 is folded within the scope of the applicant's Metal Fatigue of the Reactor Coolant Pressure Boundary Program and also closes and replaces Commitment No. 38 with respect to the reanalyses for the charging nozzles.

The staff verified that the applicant incorporated Commitment Nos. 40 and 41 within the scope of LRA FSAR Supplement No. A.2.1, which provided the summary description for the applicant's Fatigue of the Reactor Coolant Pressure Boundary Program (Commitment Nos. 40 and 41). This replaces Commitment No. 38 for the portions related to the surge line hot leg nozzle and charging nozzles; thus, Commitment No. 38 is considered to be completed. The staff finds the applicant's response in the supplemental letter acceptable because the commitment to update the baseline CUF calculations for surge line hot leg nozzle and charging nozzles is consistent with the "detection of aging effects" program element of GALL AMP XI.M1, "Metal Fatigue of the Reactor Coolant Pressure Boundary" for performance of "periodic update of the fatigue usage calculations." Based on this determination, that staff concludes that Commitment Nos. 40 and 41 provide an acceptable basis for accepting the aging management of metal fatigue of the charging nozzles and surge line hot leg nozzle in accordance with 10 CFR 54.21(c)(1)(iii) because the applicant will use the existing Metal Fatigue of the Reactor Coolant Pressure Boundary AMP to manage the effects of metal fatigue (i.e., identified as cracking-fatigue in the relevant AMRs) during the period of extended operation. Open Item 4.3-3 is resolved.

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in Class 1 piping and piping nozzles during the period of extended operation. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER

Section 3.0.3.2.24. The applicant's aging management is consistent with the recommendations of the SRP-LR.

4.3.2.7.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of ASME Code Section III Class 1 piping and piping nozzles in LRA Section A3.2.1. The staff reviewed the amended LRA Section A2.1 provided by the applicant in supplemental letter dated June 9, 2008 and verified that the applicant incorporated the commitments that are provided in LRA Commitment No. 40 and Commitment No.41. The staff determines that the USAR Supplement summary description in LRA Section A2.1 and A3.2.1: (a) adequately summarizes the options relied on for TLAA acceptance and Commitment Nos. 40 and 41 and (b) appropriately applies to the assessment in LRA Section 4.3.2.7 and to the USAR Supplement summary description in LRA Section A2.1 and A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address ASME Code Section III Class 1 piping and piping nozzles is adequate.

4.3.2.7.4 Conclusion

On the basis of its review of the thermowells, the staff concludes that the applicant has demonstrated pursuant to 10 CFR 54.21(c)(1)(i) and for ASME Code Section III Class 1 piping and piping nozzles, the analyses for thermowells remains valid for the period of extended operation. For the remaining Class 1 piping pressure boundary items, the applicant has demonstrated that pursuant to 10 CFR 54.21(c)(1)(iii), the effects of aging on the intended function will be adequately managed for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.8 Bulletin 88-11 Revised Fatigue Analysis of the Pressurizer Surge Line for Thermal Cycling and Stratification

4.3.2.8.1 Summary of Technical Information in the Application

LRA Section 4.3.2.8 summarizes the evaluation of NRC Bulletin 88-11 revised fatigue analysis of the pressurizer surge line for thermal cycling and stratification for the period of extended operation. The original surge line fatigue analysis used ASME Code Addenda through Summer 1979. In response to the NRC Bulletin 88-11 thermal stratification concerns, the surge line design was reanalyzed to the 1986 ASME Code. This analysis later was re-evaluated for effects of snubber removals. These reevaluation results are incorporated into the piping and main-loop nozzle code design reports. Winter 1982 and later ASME Code addenda state stress limits for high-cycle fatigue of Class 1 supports under Subarticle NF-3330; however, the reevaluation of the surge line for NRC Bulletin 88-11 did not retroactively impose these requirements and therefore no TLAA arises for design of the supports.

The surge line is subject to fatigue monitoring. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure either that the usage factor remains valid for the period of extended operation or that appropriate corrective measures maintain the design and licensing basis. Effects of fatigue in the Class 1 surge line will thereby be managed for the period of extended operation.

4.3.2.8.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.8 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.

During the audit, the staff reviewed a basis document that describes thermal stratification in the pressurizer surge lines. The staff noted that the maximum calculated CUF at any location in the surge line, under the current analysis of record, including thermal stratification effects, is less than 1.0. The staff also confirmed that the fatigue usage of the nozzle-to-safe-end and safe-end-to-pipe welds are no longer the basis of a safety determination because a crack was discovered in 2006 and a weld overlay was applied in these areas (verified by the staff). The staff finds that maintaining fatigue usage below 1.0 would prevent crack initiation. If a crack has initiated, there is no need for a fatigue usage evaluation. The staff agrees that the reliability of the weld overlay area will be verified by periodic inspections and by flaw propagation analyses, which are not considered as TLAAs. The staff's evaluation of these flaw propagation analyses is documented in SER Section 4.3.2.4.2.

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in the pressurizer surge line during the period of extended operation. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations of the SRP-LR.

4.3.2.8.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of NRC Bulletin 88-11 revised fatigue analysis of the pressurizer surge line for thermal cycling and stratification in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address bulletin 88-11 revised fatigue analysis of the pressurizer surge line for thermal cycling and stratification is adequate.

4.3.2.8.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for NRC Bulletin 88-11 revised fatigue analysis of the pressurizer surge line for thermal cycling and stratification, 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.9 Primary Coolant System Heatup Expansion Noise Events

4.3.2.9.1 Summary of Technical Information in the Application

LRA Section 4.3.2.9 summarizes the evaluation of primary coolant system heatup expansion noise events for the period of extended operation. Since 1990, there have been abrupt audible events heard inside containment, toward the end of primary system heatups. These audible events have been attributed to an abrupt release of differential expansion energy originally believed to be at the crossover piping supporting saddle shims, later found to occur probably also between the reactor vessel support pads and shoes under the vessel main loop nozzles. The evaluation of these effects on the vessel, piping, nozzle, and component fatigue analyses is a TLAA, as is the projection of shakedown effects in a reactor vessel support element.

The LRA states that the evaluation found that the effect of these events on the reactor pressure vessel, reactor coolant loop and support fatigue analyses, and the reactor coolant loop LBB analysis is zero or insignificant for the period of extended operation. The effect of these events has been projected to the end of the period of extended operation. The effect of this event on vessel supports is within normal and upset allowables, with the exception of a local region of the reactor vessel support cooling box. This region is shaking down or has shaken down to a stable response to these events and therefore will be suitable for the period of extended operation. The effects of these events on the steam generator primary nozzles have been projected to the end of the period of extended operation.

4.3.2.9.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.9 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, the staff reviewed the applicant's assumption that 11 noise events per refueling cycle could occur and the comparison with the quasi-dynamic monitoring data. The staff finds that the fatigue analysis, which assumed that 330 noise events would occur in a 60-year design life is still valid. In addition, the staff finds that the applicant verifies this by monitoring the noise occurrence. On this basis, the staff concludes that the applicant's analysis assumption is valid in accordance with the requirements of 10 CFR 54.21(c)(1)(i).

4.3.2.9.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of primary coolant system heatup expansion noise events in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address primary coolant system heatup expansion noise events is adequate.

4.3.2.9.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for primary coolant system heatup expansion noise events, the analyses remain valid for the period of extended operation. The staff also concludes that the

USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.10 High Energy Line Break Postulation Based on Fatigue Cumulative Usage Factor

4.3.2.10.1 Summary of Technical Information in the Application

LRA Section 4.3.2.10 summarizes the evaluation of HELB postulation, based on fatigue CUF for the period of extended operation. Selection of pipe failure locations for evaluation of the consequences on nearby essential SSCs, except for the reactor coolant loop, is in accordance with RG 1.46 and Branch Technical Positions ASB 3-1 and MEB 3-1. A revised stress analysis also permitted omission of the surge line intermediate breaks. An LBB analysis eliminated large breaks in the main reactor coolant loops.

The LRA states that break locations which depend on usage factor and their absence in the surge line will remain valid as long as the calculated usage factors are not exceeded. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure that the calculated fatigue usage factors upon which the HELB break locations are based, and the HELB locations, will remain valid for the period of extended operation or that appropriate corrective measures will maintain the design and licensing basis.

4.3.2.10.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.10 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 the HELB locations generally occur at high stress and fatigue locations. These HELB locations are identified based on a limiting stress criterion and on a CUF criterion as specified in NUREG-0800, Revision 1, "Standard Review Plan for the Review of Safety Analysis Report of Nuclear Power Plants," Section 3.6.2, Branch Technical Position 3-1, dated July 1981. In addition, a pipe break is postulated for any intermediate point where stress exceeds 2.4 allowable design stress intensity (i.e., Sm) and usage factor exceeds 0.1.

During the audit, the staff confirmed that the applicant eliminates pipe breaks in the main reactor coolant loops based on NRC approved LBB analyses and in accordance with 10 CFR Part 50, Appendix A, GDC 4. The evaluation of the LBB analysis is discussed in SER Section 4.3.2.11.

During the audit, the staff reviewed the basis documents and confirmed that all the fatigue usages of surge line intermediate points are less than 0.1 and the stresses are less than 2.4 Sm. The staff also reviewed the applicant's CLB and confirmed that surge line intermediate break locations were eliminated from the design basis. On the basis that surge line intermediate breaks locations postulation is no longer required, the staff finds the applicant's omission of the surge line intermediate breaks in the revised stress analysis acceptable.

The staff agrees that there are no postulated break locations based on fatigue usage for the reactor coolant loop and that the Metal Fatigue of Reactor Coolant Pressure Boundary Program will track the transient cycles applicable to the surge lines to ensure that design limit will not be reached during the period of extended operation or to provide corrective actions if this happens. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations of the SRP-LR.

4.3.2.10.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of high energy line break postulation based on fatigue cumulative usage factor in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address high energy line break postulation based on fatigue cumulative usage factor is adequate.

4.3.2.10.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for high energy line break postulation based on fatigue cumulative usage factor, 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2.11 Fatigue Crack Growth Assessment in Support of a Fracture Mechanics Analysis for the Leak-Before-Break Elimination of Dynamic Effects of Primary Loop Piping Failures

4.3.2.11.1 Summary of Technical Information in the Application

LRA Section 4.3.2.11 summarizes the evaluation of fatigue crack growth assessment in support of a fracture mechanics analysis for the LBB elimination of dynamic effects of primary loop piping failures for the period of extended operation. An LBB analysis eliminated the large breaks in the main reactor coolant loops and permitted omission of evaluations of their jet and pipe whip effects and consequent omission of large jet barriers and whip restraints. The containment pressurization and equipment qualification analyses retained the large-break assumptions. The dynamic effects from postulated pipe breaks have been eliminated from the structural design basis of the reactor coolant system primary loop piping as allowed by GDC 4. The elimination of these breaks is the result of the application of LBB technology approved for WCGS by the NRC. The applicant's final licensing basis LBB submission is the proprietary WCAP-10691, "Technical Basis for Eliminating Large Primary Loop Pipe Rupture as a Structural Design Basis for Callaway and Wolf Creek Plants." The NRC approval of this use of LBB was granted with NUREG-0881, the SER for the original license, as a 10 CFR 50.12 exemption from parts of GDC 4. The fracture mechanics analysis is not time-dependent and; therefore, not a TLAA. However, the final LBB submission is also supported by a fatigue crack growth assessment for a 40-year design life, which is a TLAA. There is no licensing basis evaluation of embrittlement of the cast reactor coolant piping or other cast austenitic stainless steel apart from the LBB question.

The LRA states that the LBB analysis found that fatigue crack growth effects will be negligible. The basis for evaluation of fatigue crack growth effects in the LBB analysis will remain unchanged if the number of occurrences of each transient remains below the number assumed for the existing analysis of fatigue crack growth effects. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure (1) that the number of occurrences of each transient cycle in the primary loop piping remains below the number specified by the design specifications during the period of extended operation; and therefore, below the number assumed for the existing analysis of fatigue crack growth effects; or (2) that appropriate corrective measures maintain the design and licensing basis. Therefore, the effects will be managed for the period of extended operation.

4.3.2.11.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2.11 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.

During the audit, the staff reviewed the final licensing basis for LBB and confirmed that saturated material fracture toughness was used in the LBB evaluation. On the basis that saturated material fracture toughness is not time-dependent, the staff concludes that the fracture mechanics analysis is not a TLAA.

The fatigue crack growth evaluation of the LBB used 40-year design events with various initial crack sizes from 10 to 15 percent of the wall thickness. The staff reviewed the results and indicated that the crack growth for 40-year design events is very small (i.e., the worst case is approximately 10 percent of the initial crack size). ASME Code Section XI, Tables IWB-3514-1 and IWB-3514-2 identify that the allowable crack depth for the pre-service examination is approximately 9 percent of the wall thickness for the primary RCS piping. The applicant's fatigue crack growth evaluation demonstrates that the 10 percent wall thickness initial crack depth will grow to around 11 percent, and that the 15 percent wall thickness initial crack depth will grow to around 16.5 percent. On the basis of this fatigue crack growth result, the staff can project that an initial 9 percent wall thickness crack depth will grow to approximately 11 percent wall thickness crack depth in a 60-year design life. The flaw growth evaluation due to PWSCC was not considered. However, the applicant is monitoring PWSCC and will address this aging effect issue under its current licensing requirements. On this basis, the staff concludes that this is acceptable.

The staff finds that the applicant's proposed AMP to manage the effects of fatigue to justify the fatigue crack growth evaluation remains valid. The applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events to ensure (1) that the operating cycles of the events remains within the cycles of analyzed design allowable events, or (2) that appropriate reevaluation or other corrective action is taken if a design-basis number of events is exceeded. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations in the SRP-LR.

4.3.2.11.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of fatigue crack growth assessment in support of a fracture mechanics analysis for the LBB elimination of dynamic effects of primary loop piping failures in LRA Section A3.2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue crack growth assessment in support of a fracture mechanics analysis for the LBB elimination of dynamic effects of primary loop piping failures is adequate.

4.3.2.11.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for fatigue crack growth assessment in support of a fracture mechanics analysis for the LBB elimination of dynamic effects of primary loop piping failures, 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 ASME Code Section III Subsection NG Fatigue Analysis of Reactor Pressure Vessel Internals

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3 summarizes the evaluation of ASME Code Section III, Subsection NG, fatigue analysis reactor pressure vessel internals for the period of extended operation. The reactor vessel internals were designed after the incorporation of Subsection NG into the 1974 Edition of the ASME Code, Section III. The design meets the intent of paragraph NG-3311(c); that is, design and construction of core support structures meet Subsection NG in full, and other internals are designed and constructed for their effects on the core support structures to remain within the core support structure code limits. As fatigue usage factor depends strongly not on flow-induced vibration or other high-cycle time-dependent effects at steady-state conditions but on effects of operational, upset, and emergency transient events, the increase in operating life to 60 years should not have a significant effect on fatigue usage factor, as long as the number of design-basis transient cycles remains within the number assumed by the original analysis.

The LRA states that the applicant will obtain a design report amendment either to quantify the increase in high-cycle fatigue effects or to confirm that the increase will be negligible. The applicant will complete this action before the end of the current licensed operating period. The analysis of these fatigue effects in reactor internals will thereby be revised for the period of extended operation.

The LRA states that transient cycle counting under the Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure that the design basis fatigue usage factor limit of 1.0 will not be exceeded in any analyzed location in the reactor internals without being identified and evaluated, which includes taking any necessary mitigating actions. The effects of fatigue and other mechanisms in the barrel-to-former and baffle-to-former will be managed with the Reactor

Coolant System Supplement AMP. Therefore, fatigue in the reactor vessel internals will be adequately managed 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)(ii), that the analyses have been projected for the period of extended operation or, 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 found that for locations with reported usage factors that are less than 0.66, fatigue in the reactor vessel internals has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii); and for locations with reported usage factors that are greater than 0.66, fatigue in the reactor vessel internals will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

In the LRA, the applicant stated that some part of the fatigue usage in the reactor pressure vessel internals is due to high-cycle effects. Therefore, it depends on steady-state operating time rather than on the number of transient events. Hence, high-cycle fatigue must be evaluated separately in order to extend the conclusion of the supplementary design report to the end of the 60-year operating period. In LRA Section 4.3.3, the applicant stated that the analysis of high-cycle fatigue effects in reactor internals will be revised for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(ii).

However, 10 CFR 54.21(c)(1)(ii) states that the applicant shall demonstrate that the analyses have been projected to the end of the period of extended operation. The analyses has not been completed for the staff's review. Therefore, the applicant did not satisfy the requirement described in 10 CFR 54.21(c)(1)(ii).

By letter dated November 30, 2007, the applicant provided its assessment of the impact of high-cycle fatigue to the total fatigue usage factor for the reactor pressure vessel internals. In its review of the letter of November 30, 2007, the staff noted that the projected CUFs for the reactor vessel internals will not exceed 1.0. There were two conclusions regarding the applicant's metal fatigue analysis for the reactor vessel internals that were of concern to the staff on the validity of the conclusion. These were: (1) the vibratory stresses for the reactor vessel internals are very small when compared to the thermal transient stresses, and (2) the usage from high-cycle effects is negligible. To address this issue, the applicant amended the LRA to include Commitment No. 24. In this commitment, the applicant stated that it would either obtain a design report amendment to quantify the increase in high-cycle fatigue effects, or else confirm that the increase in the CUFs for the reactor vessel internals will be negligible. The staff informed the applicant that it might need to verify the validity of the applicant's assessment by performing an audit of the plant basis documents in early 2008. The staff identified this issue as OI 4.3.

The staff audited the applicant's calculation BB-S-029 Revision 0, titled "ASME Code Design Stress Report for Wolf Creek Generating Station Reactor Vessel Internals" and validation letter W LTR SAP 07-28. The staff's audit verified that, for some locations (representative), fatigue usage from high-cycle loadings (*e.g.*, flow-induced vibrations) was calculated and found to be negligible. This indicates that vibratory stresses were very small compared to thermal transient stresses and do not have a contributing effect in the fatigue CUF calculation. For the remainder of the locations high-cycle fatigue due to vibration was not calculated because the vibratory stresses were thought to be very small compared to thermal transient stresses. The staff finds the applicant's approach acceptable and concludes that the part of OI 4.3 which refers to the vessel internals (Section 4.3.3) is resolved, and that the applicant has fulfilled LRA Commitment No. 24.

The staff noted that, with the exception of the baffle former and baffle former bolts, the applicant also credited transient cycle counting under the Metal Fatigue of Reactor Coolant Pressure Boundary Program to manage the effects of fatigue in the reactor vessel internals in accordance with the requirements of 10 CFR 54.21(c)(1)(iii). The applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is designed and credited to track the events occurring at the plant in order to ensure that: (a) the accumulated number of operating cycles for the transients analyzed for in the CUF calculations will remain within the number of cycles that were analyzed and allowed for in the design basis CUF calculations or (b) appropriate reevaluation or other corrective actions, if the allowable number of cycles is projected to be exceeded. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. This evaluation, which includes the staff's basis for acceptance, is also valid for evaluation and acceptance of the aging management of the metal fatigue in the reactor vessel internals in accordance with the requirements of 10 CFR 54.21(c)(1)(iii). Based on this review, the staff concludes that the applicant's aging management is consistent with the recommendations in the SRP-LR.

The staff noted that the applicant, based on industrial operating experience, has indicated that cracking of the reactor internal baffle-to-former bolts may be induced by either metal fatigue or by stress corrosion cracking, including irradiated-assisted stress corrosion cracking. Because of this, the applicant has credited: (a) its Reactor Coolant System Supplement Program to provide aging management of metal fatigue of the baffle/former bolts in accordance with 10 CFR 54.21(c)(1)(iii) and (b) to manage the effects of cracking, regardless of the mechanism (i.e., metal fatigue or stress corrosion cracking/irradiated-assisted stress corrosion cracking) that may potentially induce cracking in the components. The staff's evaluation of the Reactor Coolant System Supplement Program is documented in SER Section 3.0.3.3.2. This evaluation, which includes the staff's basis for acceptance, is also valid for the staff's evaluation and acceptance that the program will be capable of managing cracking in the baffle-to-former bolts caused by metal fatigue. Based on this review, the staff concludes that the applicant may use the Reactor Coolant System Supplement Program to manage the effects of metal fatigue-induced cracking in these bolting components, in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

4.3.3.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of ASME Code Section III subsection NG fatigue analysis for the reactor pressure vessel internals in LRA Section A3.2.2. On the basis of its review of the USAR supplement and resolution of the reactor vessel internals portion of OI 4.3, the staff concludes that the summary description of the applicant's actions to address ASME Code Section III subsection NG fatigue analysis, reactor pressure vessel internals is adequate.

4.3.3.4 Conclusion

On the basis of its review as discussed above, the portion of OI 4.3 which refers to the impact of high-cycle fatigue to the CUF for the reactor vessel internals has been resolved. The staff concludes that the applicant has demonstrated for ASME Code Section III subsection NG fatigue analysis of reactor pressure vessel internals, the analyses have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii) and the effects of aging on the intended function(s) will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii). The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.4 Effects of the Reactor Coolant System Environment on Fatigue Life of Piping and Components (Generic Safety Issue 190)

4.3.4.1 Summary of Technical Information in the Application

LRA Section 4.3.4 summarizes the evaluation of effects of the reactor coolant system environment on fatigue life of piping and components (Generic Safety Issue (GSI) 190) for the period of extended operation. The fatigue data for the ASME Code Section III fatigue curves are the results of tests in air at room temperature and constant strain rate. Concerns over possible effects of elevated temperature, reactor coolant chemistry environments, and different strain rates prompted NRC-sponsored research to assess them in NUREG/CR-5999, "Interim Fatigue Design Curves for Carbon, Low-Alloy, and Austenitic Stainless Steels in LWR Environments." Subsequent research and studies, including NUREG/CR-6260, "Application of NUREG/CR-5999 Interim fatigue Curves to Selected Nuclear Power Plant Components," refined the methods. The NRC concluded that effects of the reactor coolant environment perhaps should be included in the calculated fatigue life of components and opened three GSIs to address this question; all finally closed to a single issue, GSI 190. Although GSI 190 has been closed for plants with 40-year initial licenses, NUREG-1800 states that, "the applicant's consideration of the effects of coolant environment on component fatigue life for license renewal is an area of review," noting the staff recommendation "...that the samples in NUREG/CR-6260 should be evaluated considering environmental effects for license renewal."

NUREG/CR-6260 identifies seven sample locations for newer Westinghouse plants like WCGS:

- reactor vessel lower head to shell juncture
- reactor vessel primary coolant inlet nozzles
- reactor vessel primary coolant outlet nozzle
- surge line hot leg nozzle
- charging nozzles
- safety injection nozzles
- residual heat removal line inlet transition

WCGS performed plant-specific calculations for the seven locations and evaluated effects of the reactor coolant environment on fatigue calculations using the appropriate F_{EN} factors from NUREG/CR-6583 and NUREG/CR-5704. At the first location, the vessel lower head to shell juncture, the expected 60-year fatigue usage factor was determined by multiplying the design basis 40-year usage factor times 1.5. All others were projected from historical and current rates of accumulation of transient cycles and usage factors, using either the cycle-based method or the stress-based method of the Metal Fatigue Program of Reactor Coolant Pressure Boundary Program. The inlet, outlet, safety injection, and accumulator-RHR nozzle predictions used the cycle-based method. The remaining hot leg and charging nozzle predictions used the stress-based method.

The LRA states that the analysis showed that the fatigue usage factors in the NUREG/CR-6260 sample locations should remain less than 1.0 for the period of extended operation (including the effects of the reactor coolant environment); and, that the safety determination supported by the code fatigue analyses should therefore remain valid. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will include appropriate usage factor action limits to ensure that the usage factor at the remainder of these locations, including F_{EN}, does not exceed 1.0 before an evaluation is completed and appropriate actions have been identified. The effects of the reactor coolant environment on fatigue usage factors in these locations will be managed 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 or 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.

During the audit, the staff reviewed LRA Section 4.3.4 against the guidance provided in SRP-LR Section 4.3.3.2. The SRP-LR recommends that license renewal applicants address the effect of the reactor coolant environment. To assess the impact of the reactor coolant environment on a sample of critical components, the SRP-LR states that the applicant should address the recommendations as follows:

- the critical components include, as a minimum, those selected in NUREG/CR-6260
- the sample of critical components has been evaluated by applying environmental correction factors to the existing ASME Code fatigue analyses
- formulas for calculating the environmental life correction factors are those contained in NUREG/CR-6583 for carbon and low-alloy steels, and in NUREG/CR-5704 for austenitic stainless steels, or an approved technical equivalent

LRA Table 4.3-5 provides the CUFs for a sample of critical components, which are calculated by applying environmental correction factors to the existing ASME Code fatigue analysis. The staff confirmed that the critical components include those selected in NUREG/CR-6260 for the newer vintage Westinghouse plants. The applicant stated that environmental life correction factors are calculated in accordance with the formulas contained in NUREG/CR-6583 for carbon and low-alloy steels, and in NUREG/CR-5704 for austenitic stainless steels. Therefore, the staff finds that WCGS has followed the staff's recommendation to assess the impact of the reactor coolant environment.

During the audit, the staff reviewed the applicant's existing fatigue analysis and requested that the applicant resolve three issues related to the CUFs calculation.

(1) numbers of transient cycles used in the fatigue evaluation:

The staff reviewed LRA Table 4.3-1 which lists estimated numbers of transient cycles for 60 years. The staff finds that the estimated 60-year cycles assume that some design transients will never occur. However, those design transients have occurred in other similar design nuclear power plants. For example, the LRA for the Shearon Harris Nuclear Power Plant states that it has experienced the following design transients within the first 18 years of operation:

- inadvertent reactor coolant system depressurization
- reactor trip cooldown with safety injection
- reactor cooldown without safety injection
- inadvertent safety injection
- excessive feedwater flow

LRA Table 4.3-1 also shows a reduction in the number of design transients. For example, WCGS experienced 55 reactor trips during the past 20 years and projected 44 reactor trips for the next 40 years. During the audit, the staff requested that the applicant explain the projection methodology which is used to develop estimated cycles to the end of the period of extended operation.

In its response dated June 7, 2007, the applicant stated that the algorithm used to predict future rates of accumulation weighs recent history more heavily than the experience obtained from the plant startup and early years of operation. The applicant clarified that the cycle reduction in the projection did not refer to reduction in the number of design transients. These projections are used for estimating probable usage factor and these are not the basis for the disposition of these fatigue TLAAs.

On the basis that the Metal Fatigue of Reactor Coolant Pressure Boundary Program is used to manage the effects of fatigue for the NUREG/CR-6260 sample locations, except the reactor vessel lower head and shell junction, the staff finds that this position is consistent with the recommendations in the SRP-LR and in accordance with the requirements of 10 CFR 54.21(c)(1)(iii). The Metal Fatigue of Reactor Coolant Pressure Boundary Program will track events to ensure (1) that the operating cycles of the events remains within the cycles of analyzed design allowable events or, (2) that appropriate reevaluation or other corrective action is taken if an analyzed number of events is exceeded.

By letter dated August 20, 2007, the applicant committed (Commitment No. 21) to address the metal fatigue in the reactor pressure boundary. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will establish an action limit and corrective actions prior to the period of extend operation.

On the basis that the corrective actions and action limits will address future transients, the staff finds Commitment No. 21 acceptable.

LRA Section 4.3.4 states that all the NUREG/CR-6260 sample locations will be age managed except the reactor vessel lower head-to-shell junction. The reactor vessel lower head-to-shell junction permits a projection of the usage for a 60-year life, equal to 1.5 times the design basis usage factor and times a conservative environmental fatigue life correction factor for carbon steel. The results include a considerable margin to the ASME Code allowance of 1.0.

On the basis that the fatigue usage factor for this location has been successfully validated and will remain below the code allowable limit of 1.0, the staff finds that the fatigue TLAA for the reactor vessel lower head-to-shell junction remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

(2) methodology used in the fatigue evaluation:

LRA Section 4.3.1.3 states that cycle-based monitoring assumes that the alternating stress range of every cycle of a transient is equal to that of the design basis, worst-case events assumed by the ASME Code fatigue analysis.

The staff's review of LRA Section 4.3.1.3 identified an area in which additional information was necessary to complete the review of the applicant's TLAA evaluation. The applicant responded to the staff's RAI as discussed below.

In RAI 4.3-3 dated July 24, 2007, the staff requested that the applicant clarify the methodology used to calculate the usage factors for the cycle-based monitoring locations. The staff requested that the applicant demonstrate the validity of the baseline fatigue usage factors.

In its response dated August 20, 2007, the applicant stated, in part:

> For the cycle-based locations (line numbers 1-4 in LRA Table 4.3-2), the Wolf Creek Generating Station (WCGS) fatigue management program uses (1) actual plant cycle count data and (2) the design basis fatigue effect of each cycle transient pair. Because all of the cycles contributing to fatigue that occurred before implementation of the fatigue monitoring program were reconstructed from reviews of historical records, all transient cycles have been accounted for since the beginning of plant life (starting from February 1984). The fatigue effect of each cycle is defined by design calculations. Thus, there are no unknown parameters needed to calculate CUF using cycle based methodology. Therefore, CUF results from cycle based monitoring represent the accurate baseline usage to date for these locations. No back-projection was necessary.

On the basis that the actual plant cycle count data and design transient defined by design calculation were used to evaluate CUFs for cycle-based locations, the staff finds this method acceptable and conservative compared with using actual transient data.

As stated in SER Section 4.3.2.7.2, the staff questioned the applicant's methodology used to calculate the baseline fatigue usage factors for the surge line hot leg nozzle, charging nozzle, and alternate charging nozzle locations.

In its response dated October 3, 2007, the applicant committed (Commitment No. 38) to address the backward projection for the surge line hot leg nozzle, charging nozzles, and alternate charging nozzles. The applicant committed to calculate an updated baseline fatigue usage factor that adequately bounds transients experienced before the monitoring of CUFs was started. The existing baseline CUF for all monitored locations will be increased to bound the potential CUF contribution from the transients that were under-represented in the existing baseline.

The staff found that the applicant would submit this reanalysis to the staff for review by January 31, 2008. This was identified as open item (OI) 4.3-3.

By letter dated January 25, 2008, the applicant provided its response to OI 4.3-3. The staff reviewed the applicant's methodology on the backward projection for the surge line hot leg nozzle, charging nozzles, and alternate charging nozzles. In its response, the applicant states its methodology would include identifying the unaccounted transients for Period 1, a review of transient records to account for any improperly counted events, and then computing a bounding CUF increment with the information gathered to update the baseline. The staff finds this acceptable because the applicant is appropriately accounting for transients that occurred in Period 1, and accounting for any transients that were not properly counted by reviewing transient records. The staff also finds it acceptable that the applicant is computing the CUF increment as a sum of the CUF from the unaccounted transients and the improperly accounted transients. However, the staff determined that additional information was necessary because the applicant did not provide the analysis results for CUF accumulated in Period 1. For this reason, the staff issued a follow-up RAI in letter dated February 28, 2008. Based on its review, the staff concludes that the response letter submitted by the applicant dated January 25, 2008 closed Commitment No. 38, except those portions related to the pressurizer hot leg surge nozzle and charging nozzle.

By letter dated May 15, 2008, the applicant provided its response letter to OI 4.3-3. The staff determined that the applicant's response did not provide the updated baseline CUF calculation for surge line hot leg nozzle and charging nozzles which were to account for the pre-MOP conditions and the differential contribution of fatigue for each charging event. The applicant supplemented this response by letter dated June 9, 2008 and committed (Commitment No.41) as part of its Metal Fatigue of the Reactor Coolant Pressure Boundary Program, to prepare an updated baseline calculation for the surge line hot leg surge nozzle based on the actual pre-MOP environment for the nozzle and an updated baseline calculation for the charging nozzles based on the consideration for the differential contribution from each category of charging events. The applicant indicated that Commitment No. 41 closes and replaces Commitment No. 38 with respect to the reanalyses for the surge line hot leg nozzle and the charging nozzles. The staff verified that the applicant's Metal Fatigue of the Reactor Coolant Pressure Boundary Program includes an enhancement, as given in LRA Commitment No. 21, to adjust the CUF values for the NUREG/CR-6260 locations (which include the charging nozzles and surge line hot leg nozzle) by the environmental F_{en} factors for the components. The staff finds this to be an acceptable basis for managing the impacts of environmentally-assisted metal fatigue on the pressure boundary function of the charging nozzles and surge line hot leg nozzle because: (a) the commitment to do the updated baseline CUF calculations for these components is consistent with the recommended criterion in the "detection of aging effects" program element in the GALL Report for performance of periodic CUF updates, (b) the applicant has committed in LRA Commitment No. 21 to adjust the CUF values for the NUREG/CR-6260 locations (which include the charging nozzles and surge line hot leg nozzle) by the environmental F_{en} factors for the components, and (c) the applicant has brought Commitment No. 41 within the scope of its existing Metal Fatigue of Reactor Coolant Pressure Boundary AMP to manage the aging effect on the components. Based on this review, the staff finds that the applicant has provided an acceptable basis for aging management of environmentally-assisted metal fatigue of the charging nozzles and surge line hot leg nozzle in accordance with 10 CFR 54.21(c)(1)(iii), because the applicant will manage the effects of environmentally-assisted metal fatigue on the pressure boundary function of the nozzles during the period of extended operation. The staff concludes that Commitment 38 regarding environmentally-assisted metal fatigue assessment for these nozzle components is resolved and completed. Based on its review, the staff concludes that OI 4.3-3 is resolved.

(3) fatigue evaluation using the FatiguePro software:

During the audit, the staff reviewed the applicant's FatiguePro stress calculations. The calculations indicate that FatiguePro only tracks one stress component for each location monitored, while a stress vector consists of 6 stress components. The staff requested that the applicant address the following items:

(a) Explain why the stress function contains only one value and what is the meaning of this stress value and justify how one stress component could be used to evaluate fatigue CUF.

(b) The report defines stress transfer function as stress intensity. Explain how stress intensity value could be used as an input for the transfer function methodology.

(c) Is the same methodology, using only one component of stress intensity vector to calculate the fatigue usage value, applied to all reactor coolant pressure boundary locations?

(d) Describe how the stress transfer functions were benchmarked for the components of WCGS.

(e) Explain how to determine the stress transfer function for S(pr), S(momxz), S(momy). Demonstrate S(pr)= 3.71, S(momyz)=9.40, S(momy)=0.0.

During the audit, the applicant explained that this one stress component is a one dimensional (1D) virtual peak stress. This stress value is obtained by summing the absolute value of the individual stress components. The applicant also indicated that Structural Integrity Associates, the consulting firm that owns FatiguePro, did not perform a benchmark of FatiguePro transfer functions to an independent standard.

The staff reviewed the applicant's response and determined that additional information was necessary to resolve the staff's concerns on the adequacy and basis for using 1D virtual peak stress, the lack of verification of the accuracy of these transfer functions, and the lack of independent benchmark.

The staff issued two RAIs. In RAI 4.3-1 (first RAI) dated June 22, 2007, the staff noted that the applicant's response to audit question TLAAA025, states that the transfer function report defines a 1D virtual stress value that is designed to bound the actual stress intensity ranges for all fatigue significant transients and this type of stress value does not have a name in the professional literature.

(a) Since it cannot be found in the professional literature, the staff requested that the applicant describe in detail how the 1D virtual stress was derived.

(b) The staff requested that the applicant demonstrate how the virtual stress bounds the actual stress intensity ranges for any thermal transient. The staff requested that the applicant show that the stress difference between any two thermal transients is also conservative since the fatigue evaluation is based on the stress difference of two events.

In its response dated July 26, 2007, the applicant provided calculations, figures, and case studies. The staff reviewed the applicant's response and determined that additional information was necessary. As documented in the teleconference summary dated September 4, 2007, the staff requested that the applicant:

(a) Clearly define 1D thermal (virtual) stresses for different locations on the component (nozzle, nozzle inner radius) and thermal conditions (stratification). In addition, explain how the 1D thermal stress is derived for the surge line hot leg nozzle under stratification.

(b) Explain what is the limitation of 1D virtual stress methodology and describe what kind of conditions cannot be mathematically proven to be conservative.

(c) Provide a justification that demonstrates ASME Code compliance using the 1D thermal (virtual) stress methodology.

In RAI 4.3-2 (second RAI) dated June 22, 2007, the staff requested the applicant to demonstrate that 1D virtual stresses for pressure, bending, and torsion can be benchmarked with close form solutions and that the stresses are within a reasonable percentage of deviation.

In its response dated July 26, 2007, the applicant provided a detailed analysis and calculations. The staff reviewed the applicant's response and determined that additional information was necessary.

As documented in the teleconference summary dated September 4, 2007, the staff noted that the applicant evaluated the fatigue CUF at the top of the pipe for all stratification cases. The top of the pipe may not be the most critical stress location for either bending or stratification. For bending, the maximum stress location is at an angle from the top of the pipe. Also, the maximum stratification stress is right above or below the temperature discontinuity.

The staff requested that the applicant justify why these two critical locations were not evaluated. The current evaluation eliminates one of the bending moment components and may not be in compliance with the ASME Code.

In a letter dated October 3, 2007, the applicant provided its response to address 1D virtual stress related issues. In the response, the applicant stated that FatiguePro 1 D stress analysis is demonstrably conservative for all load pairs that include significant transients. However, the staff noted that FatiguePro was used in another plant, which has demonstrated that 1D virtual stress method has its limitation, and may generate unconservative stress results. Therefore, the staff determined that the applicant did not provide sufficient information to address the concerns raised in the staff's follow-up questions to RAI 4.3-1. On this basis, the staff determined that this item remained open. This was identified as OI 4.3-1.

On May 1, 2008, a public meeting was held to discuss OI 4.3-1. During this meeting, the applicant presented its methodology for the confirmatory analyses of the charging nozzle and the surge line hot leg nozzle. During this meeting, the staff asked the applicant to verify the absence or presence of thermal sleeves for the charging nozzles.

By letter dated May 15, 2008, the applicant provided its response to OI 4.3-1. The staff reviewed the applicant's response and determined that it is inadequate because the confirmatory analysis was performed assuming a thermal sleeve was present in the charging nozzles, and the applicant is unsure of this assumption. The applicant also provided the results of a confirmatory analysis of the hot leg surge line nozzle. The results of the confirmatory analysis indicated that the baseline fatigue evaluations are conservative. As discussed previously, the applicant committed to update the baseline calculation to address the pre-MOP conditions (Commitment No. 41). The staff chose not to review this confirmatory analyses at this time because the applicant committed to update the calculations and verify the existence of the charging nozzle thermal sleeves. As a consequence, the fatigue calculations and supporting confirmatory analyses may be superseded. The applicant supplemented its response by letter dated June 9, 2008 and committed (Commitment No.40) to validate the presence or absence of a charging nozzle thermal sleeve, and to perform a new analysis if a thermal sleeve is not present, which will be incorporated into the Fatigue Monitoring Program. The applicant indicated that Commitment No. 40 is incorporated within the scope of the applicant's Metal Fatigue of the Reactor Coolant Pressure Boundary Program and also closes and replaces Commitment No. 38 with respect to the reanalyses for the charging nozzles. The staff find's the supplemental letter response acceptable because the applicant has committed to performing updated baseline CUF analyses for the charging nozzle as part of Fatigue Monitoring Program, pending confirmation on the presence or absence of thermal sleeve.

The staff verified that the applicant's Metal Fatigue of the Reactor Coolant Pressure Boundary Program includes an enhancement, as given in LRA Commitment No. 21, to adjust the CUF values for the NUREG/CR-6260 locations (which include the charging nozzles) by the environmental F_{en} factors for the components. The staff finds this to be an additional acceptable basis for managing the impacts of environmentally-assisted metal fatigue on the pressure boundary function of the charging nozzles because: (a) the applicant has brought Commitment No. 40 within the scope of its Metal Fatigue of the Reactor Coolant Pressure Boundary Program, (b) the commitment to do the updated baseline CUF calculations for these components is consistent with the recommended criterion in the "detection of aging effects" program element in the GALL Report for performance of periodic CUF updates, and (c) the applicant has committed in LRA Commitment No. 21 to adjust the CUF values for the NUREG/CR-6260 locations (which include the charging nozzles and surge line hot leg nozzle) by the environmental F_{en} factors for the components. Based on this determination, the staff concludes that the aging management of environmentally-assisted metal fatigue for the charging nozzles is acceptable in accordance with 10 CFR 54.21 (c)(1)(iii) because the applicant will manage the impacts of environmentally-assisted metal fatigue on the intended pressure boundary function of the nozzles in accordance with its Metal Fatigue of the Reactor Coolant Pressure Boundary Program, during the period of extended operation. Therefore, the staff concludes that OI 4.3-1 is resolved.

The staff also inquired about the critical fatigue location. In its response to the critical fatigue location questions dated October 3, 2007, the applicant explained that for newer vintage Westinghouse plants, the critical fatigue location on the pressurizer surge line is the reactor coolant system hot leg surge line nozzle. The applicant also stated that the surge line pipe location is not a location for which environmental effects of the reactor coolant require evaluation.

The staff finds the applicant's response to RAI 4.3-2 acceptable because for newer vintage Westinghouse plant, like WCGS, the critical fatigue location on the pressurizer surge line is the hot leg surge line nozzle. In addition, as a result of RAI 4.3-3, the applicant committed (Commitment No. 38) to recalculate the baseline usage factor for the surge line hot leg nozzle. The staff's concern described in RAI 4.3-2 is resolved.

Pursuant to 10 CFR 54.21(c)(1)(iii), the applicant will manage the effects of fatigue in Class 1 piping and piping nozzles during the period of extended operation. The staff's evaluation of the applicant's Metal Fatigue of Reactor Coolant Pressure Boundary Program is documented in SER Section 3.0.3.2.24. The staff concludes that the applicant's aging management is consistent with the recommendations in the SRP-LR.

4.3.4.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of effects of the reactor coolant system environment on fatigue life of piping and components (GSI 190) in LRA Section A3.2.3. The staff determined that the USAR Supplement summary description in LRA Section A3.2.3 adequately summarizes the options relied on for TLAA acceptance and that Commitment No. 21, 40 and 41, as amended in the applicant's supplemental response letter dated June 9, 2008, appropriately applies to the assessment in LRA Section 4.3.4 and to the USAR Supplement summary description in LRA Section A3.2.3 and A2.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address effects of the reactor coolant system environment on fatigue life of piping and components (GSI 190) is adequate.

4.3.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated: (a) pursuant to 10 CFR 54.21(c)(1)(i), the analyses remain valid for the period of extended operation or (b) pursuant to 10 CFR 54.21(c)(1)(iii) and for the effects of the reactor coolant system environment on fatigue life of piping and components (GSI 190), 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 USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.5 Assumed Thermal Cycle Count for Allowable Secondary Stress Range Reduction Factor in B31.1 and ASME Code Section III Class 2 and 3 Piping

4.3.5.1 Summary of Technical Information in the Application

LRA Section 4.3.5 summarizes the evaluation of assumed thermal cycle count for allowable secondary stress range reduction factor in ASME Code B31.1 and ASME Code Section III Classes 2 and 3 piping for the period of extended operation. Piping within the scope of license renewal designed to ASME Code B31.1 or Section III Class 2 and 3 requires application of a stress range reduction factor to the allowable stress range for secondary stresses to account for thermal cyclic conditions.

If the number of equivalent full-temperature thermal cycles is less than 7,000, the stress reduction factor is 1. Therefore, if the number of cycles remains below this number for a 60-year life, the stress reduction factor remains at 1 and the stress range reduction factor used in the piping analysis will not be affected by extending the operation period to 60 years.

4.3.5.2 Staff Evaluation

The staff reviewed LRA Section 4.3.5 to verify that the ASME Code B31.1 and Section III, Class 2 and 3, piping analyses remain valid for the period of extended operation pursuant to 10 CFR 54.21(c)(1)(i), and that the sample lines analyses have been projected to the end of the period of extended operation, pursuant to 10 CFR 54.21(c)(1)(ii).

The staff agrees with the applicant that the plant does not operate in a cycling mode that would expose the piping to more than three thermal cycles per week (i.e., to more than 7,000 cycles in 60 years), with the exception of the reactor coolant sampling lines. On the basis that the projected 60-year value would not exceed the design cycle limit of 7,000 cycles, the staff concludes that, with the exception of the reactor coolant sample lines, the ASME Code B31.1 and Section III, Class 2 and 3, piping analyses remain valid in accordance with 10 CFR 54.21(c)(1)(i).

LRA Section 4.3.5 indicates that the piping analyses for the reactor coolant sample lines will be revised in accordance with 10 CFR 54.21(c)(1)(ii), for the duration of the period of extended operation.

However, 10 CFR 54.21(c)(1)(ii) states that the applicant shall demonstrate that the analyses have been projected to the end of the period of extended operation. The analyses have not been completed for the staff's review and; therefore, do not satisfy the requirements described in 10 CFR 54.21(c)(1)(ii).

By letter dated November 30,2007, the applicant addressed its assumed thermal cycle count for allowable secondary stress range reduction factor in B31.1 and ASME III Class 2 and 3 piping. In addition, the applicant also made a commitment to complete the reanalysis of the reactor coolant sample lines and any additional corrective actions or modifications as appropriate, in accordance with 10 CFR 54.21(c)(1)(i). This is documented as Commitment No. 25. The staff planned to verify the validity of the applicant's assumptions by performing an audit of the plant basis documents. This was identified as OI 4.3 which includes two parts; the first part of OI 4.3 has been discussed and resolved in SER Section 4.3.3.

In the letter dated November 30, 2007, the applicant claimed that based on further review of the original stress calculations for the reactor coolant sample lines (submitted as supplemental information), the calculations and related assumptions are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). In addition, the applicant claimed that survey of all plant piping systems found that some of the reactor coolant sample lines may be subject to more than 7,000 cycles but less than 11,000 full temperature cycles in 60 years, requiring a Stress Range Reduction Factor (SRRF) of 0.9 times the allowable stress value in accordance with NC-3611.2. The applicant identified three evaluations that required further review. Further review of existing calculations by the applicant revealed that the original calculations of these three reactor coolant sample lines were performed utilizing a SRRF of 0.9. Based on SRP-LR Table 4.3-1, a SRRF of 0.9 is required for piping experiencing full temperature cycles between 7,000 and 14,000. During the audit of calculations (J-SJ16-3 and J-SJ16-4, "Stress Analysis of Instrument Lines, System SJ – Post Accident Sampling System, Auxiliary and Reactor Building" and J-SJ03-1, "Tube Support Loads and Locations for System SJ – Nuclear Sampling System – Auxiliary Building"), the staff verified conclusively that a SRRF of 0.9 was incorporated into the analyses. Based on the staff's review as described above, the staff concludes that the second part of OI 4.3 is also resolved. Similarly, the staff concludes that the applicant has fulfilled Commitment No. 25 because it is no longer needed.

4.3.5.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of assumed thermal cycle count for allowable secondary stress range reduction factor in ASME Code B31.1 and Section III Class 2 and 3 piping in LRA Section A3.2.4. On the basis of its review of the USAR supplement and the resolution of the stress range reduction factor for thermal expansion stress portion of OI 4.3, the staff concludes that the summary description of the applicant's actions to address assumed thermal cycle count for allowable secondary stress range reduction factor in ASME Code B31.1 and Section III Class 2 and 3 piping is adequate.

4.3.5.4 Conclusion

On the basis of its review as discussed above, the portion of OI 4.3 which refers to the stress range reduction factor for the thermal expansion stresses in B31.1 and ASME III Class 2 and 3 piping has been resolved and the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), the ASME Code B31.1 and Section III, Class 2 and 3, piping analyses remain valid for the period of extended operation, which include the reactor coolant sample lines analyses. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.6 Fatigue Design of Spent Fuel Pool Liner and Racks for Seismic Events

4.3.6.1 Summary of Technical Information in the Application

LRA Section 4.3.6 summarizes the evaluation of fatigue design of spent fuel pool liner and racks for seismic events for the period of extended operation. The spent fuel pool racks were replaced to accommodate a larger inventory. The design of the replacement racks included a fatigue analysis of the racks and of high-stress locations in the pool liner. Operating-basis and safe-shutdown earthquakes (OBE and SSE) are the only DBEs for cyclic loading on the fuel pool liner and racks. No detectable seismic events have occurred in the 20-year operating history of the plant to date; therefore, the design basis number of events remains sufficient for the remainder of the original license operating period, plus the 20-year licensed operating period extension. The replacement racks are presently qualified for the number of these events now expected for the remainder of a 60-year life.

The analysis for both the racks and liner depend only on the assumed number of OBE and SSE events. Although an ASME Code Section III Class 1 pressure boundary fatigue analysis would omit the faulted SSE loads, this analysis included them because spent fuel storage must continue to function following these events. The analysis remains valid for any period for which the number of OBE events has not been and is not expected to be exceeded, assuming an additional SSE event might occur. As the remaining plant life from the present to the end of the period of extended operation (2006 to 2045) is less than that of the original license to which the numbers of OBE and SSE events apply and as no SSE or significant OBE has occurred, these analyses remain 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.

During the audit, the staff asked the applicant to clarify what is meant by the term "significant OBE."

In its response, the applicant stated that a significant earthquake would be one producing sufficient ground acceleration to trigger the free field strong motion accelerometer, which can be adjusted over a minimum range of 0.01 to 0.03. To date, no actuation of the strong motion accelerometer trigger has been attributable to an earthquake.

On the basis that no seismic events have occurred in the 20-year operating history of the plant, the staff concludes that the design basis number of events remains sufficient for the period of extended operation. Therefore, the staff concludes that the applicant has adequately demonstrated that the analyses remain valid for the period of extended operation in accordance with the requirements of 10 CFR 54.21(c)(1)(i).

4.3.6.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of fatigue design of spent fuel pool liner and racks for seismic events in LRA Section A3.2.5. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue design of spent fuel pool liner and racks for seismic events is adequate.

4.3.6.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for fatigue design of spent fuel pool liner and racks for seismic events, the analyses remain valid for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.7 Fatigue Design and Analysis of Class IE Electrical Raceway Support Angle Fittings for Seismic Events

4.3.7.1 Summary of Technical Information in the Application

LRA Section 4.3.7 summarizes the evaluation of fatigue design and analysis of Class IE electrical raceway support angle fittings for seismic events for the period of extended operation. The design of the Class IE electrical raceway included a fatigue evaluation of the effects of OBE and SSE loads on angle fittings at the connections of strut hangers to overhead supports or at interhanger locations. The seismic fatigue analysis of Class IE electrical support angle fittings was conservative, assuming 1000 allowable cycles for a deflection, considerably less than the endurance limit. OBEs and SSEs are the only DBEs for cyclic loading on these support angle fittings. Furthermore, no detectable seismic events have occurred in the 20-year operating history of the plant to date. Thus, the design basis number of events remains sufficient for the remainder of the original licensed operating period, plus the period of extended operation. Therefore, the analysis is valid for the period of extended operation.

4.3.7.2 Staff Evaluation

The staff reviewed LRA Section 4.3.7 to verify, pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The staff finds that the only cyclic loads applied to these support angle fittings will occur during an OBE or SSE. Based on recommendations in Institute of Electrical and Electronics Engineers 344-1975, "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," the components were designed to survive five OBE and one SSE events over the lifetime of the plant. Since no seismic events have induced cyclic loads on the components during the 20-year operating history of the plant, the design-basis assumption remains valid for the period of extended operation. This assumption results in a total of 900 maximum-deflection cycles. This value was compared to an allowable value of 1000 which was much less than the indicated endurance limit on the fatigue curve.

On the basis of its review, the staff concludes that the applicant's evaluation provides a reasonable upper limit estimate on the number of maximum-deflection cycles. The staff concludes that the applicant has adequately demonstrated that the analyses remain valid for the period of extended operation in accordance with the requirements of 10 CFR 54.21(c)(1)(i).

4.3.7.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of fatigue design and analysis of Class IE electrical raceway support angle fittings for seismic events in LRA Section A3.2.6. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address fatigue design and analysis of Class IE electrical raceway support angle fittings for seismic events is adequate.

4.3.7.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for fatigue design and analysis of Class IE electrical raceway support angle fittings for seismic events, the analyses remain valid for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electrical Equipment

The 10 CFR 50.49 EQ program is a TLAA for purposes of license renewal. The TLAA of the environmental qualification (EQ) of electrical components includes all long-lived, passive, and active electrical and I&C components that are important to safety and are 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.

Pursuant to 10 CFR 54.21(c)(1), the applicant must provide a list of EQ TLAAs in the LRA. The applicant shall demonstrate that for each type of EQ equipment, one of the following is true: (1) the analyses remain valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

4.4.1 Summary of Technical Information in the Application

LRA Section 4.4 summarizes the evaluation of EQ of electrical equipment for the period of extended operation. Section 50.49(e)(5) of 10 CFR requires consideration of all significant types of aging degradation that can affect component functional capability and component replacement or maintenance prior to the end of designated life unless additional life is established through ongoing qualification. Additionally, it permits different qualification criteria based on plant vintage. Supplemental EQ regulatory guidance for compliance with these different qualification criteria is stated in the RG 1.89, Revision 1, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants," and NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment." The applicant stated that its EQ program is consistent with 10 CFR 50.49 and NUREG-0588. Qualified components and their service requirements and environments are identified in a controlled equipment qualification summary document with a program description, a master list of affected equipment, replacement and maintenance information, and local environment descriptions. The qualification evaluation records for specific component types are maintained in equipment qualification work packages. The existing Environmental Qualification of Electrical Components Program manages the aging effects so EQ components will continue to perform their intended functions for the period of extended operation. Aging effects addressed by this program will thereby be managed for the period of extended operation.

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.

During the audit, the staff reviewed LRA Sections 4.4 and B3.2, and plant basis documents to determine whether the applicant provided adequate information to meet the requirements of 10 CFR 54.21(c)(1)(iii). As documented in SER Section 3.0.3.2.25, the staff finds that the EQ Program is consistent with the GALL Report. The staff finds that the qualified life of those components within the scope of the EQ Program will be maintained. The continued implementation of the EQ Program provides reasonable assurance that the aging effects will be managed and that components within the scope of the EQ Program will continue to perform their intended functions for the period of extended operation.

4.4.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of environmental qualification of electrical equipment in LRA Section A3.3. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address environmental qualification of electrical equipment is adequate.

4.4.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that for environmental qualification of electrical equipment, 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 USAR 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

LRA Section 4.5 summarizes the evaluation of concrete containment tendon prestress for the period of extended operation. The containment is a prestressed concrete, hemispherical dome-on-a-cylinder structure with a steel membrane liner. Post-tensioned tendons compress the concrete and permit the structure to withstand design-basis accident internal pressures. The steel tendons, in tension, relax and the concrete structure, which the tendons hold in compression, both creeps and shrinks with time; therefore, to ensure the integrity of the containment pressure boundary under design-basis accident loads, an inspection program confirms whether the tendon prestress remains within design limits throughout the life of the plant. The original design predictions of loss of prestress and the regression analyses of surveillance data that predict the future performance of the post-tensioning system to the end of design life are TLAAs.

The post-tensioning system consists of two tendon groups: (1) vertical, inverted-U-shaped tendons and (2) horizontal circumferential tendons. The vertical inverted-U tendons are anchored through the bottom of the conventionally-reinforced concrete basemat. The horizontal hoop tendons are anchored at three exterior buttresses 120 degrees apart. Each hoop tendon extends 240 degrees around the containment building, passing under an intervening buttress. The tendons are not bonded to the concrete but inserted in tendon ducts, after concrete cure, and tensioned in the prescribed sequence. Each tendon consists of up to 170 ¼-inch high-strength steel wires with cold-formed button heads on each end bearing on stressing washers. The total tendon load is carried by a shim stack to steel bearing plates embedded in the structure.

The condition of the containment prestressing system meets the following criteria for validation for the period of extended operation as described in NUREG-1800, Section 4.5.3.1.1: (1) The recent surveillance data for individual tendons have all fallen above the predicted force and (2) the regression analysis of surveillance lift-off data has extended the trend lines for both the vertical and horizontal cylinder tendons to 60 years. Both trend lines remain well above minimum required values for at least 60 years. The lift-off trend lines are calculated by regression of individual tendon lift-off data, including results of the most recent 2005 20-year surveillance. These calculations are therefore consistent with NRC IN 99-10, Attachment 3. The surveillance data regression analysis trend lines are above the surveillance program predicted force lines. The current regression analysis of the vertical and horizontal cylinder tendons is therefore valid for the period of extended operation. The existing Concrete Containment Tendon Prestress Program ensures that the average tendon prestress in each of the vertical and hoop tendon groups will be maintained above its design-basis minimum required value for the period of extended operation.

4.5.2 Staff Evaluation

The staff reviewed LRA Section 4.5 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.

The staff's review of LRA Section 4.5 identified areas in which additional information was necessary to complete the review of the applicant's TLAA. The applicant responded to the staff's RAIs as discussed below.

In RAI 4.5-1 dated April 10, 2007, the staff noted that LRA Table 4.5-2 indicates that two tendon types, dome hoop and cylinder hoop, are combined into one horizontal hoop group. The total number of examined tendons for these two types was seven for the first, third, and fifth-year surveillance, and three for the tenth, fifteenth, and twentieth-year surveillance. Two dome hoop tendons were inspected at the first and third-year surveillance; however, no dome hoop tendon was inspected after the third-year surveillance. The staff found that ASME Code Section XI, Subsection IWL-2520, "Examination of Unbonded Post-Tensioning Systems," states that tendons on dome and cylinder shall be characterized into two different tendon types because of their geometry and position in the containment. It also states that the minimum number of surveillance tendons is four for each type of tendons for the first, third, and fifth-year surveillance, and three for the tenth, fifteenth, and twentieth-year surveillance. The staff requested that the applicant justify this deviation from the ASME Code requirements.

In its response dated May 9, 2007, the applicant stated that the use of a single horizontal hoop tendon surveillance group is part of the original licensing basis for this surveillance program. The WCGS tendon program was originally developed using RG 1.35, proposed Revision 3, dated 1979. The applicant stated that the program was modified to conform to the WCGS technical specification Amendment No. 152, Section 5.5.6, "Containment Tendon Surveillance Program and Containment Leakage Rate Testing Program," as a commitment to ASME Code Section XI, Subsection IWL. It also stated that a review of the program plan and specification confirmed that the present program is consistent with ASME Code Section XI, Subsection IWL, dated 1998, and with RG 1.35, Revision 3, dated 1990. Therefore, the applicant concluded that the hoop samples sizes meet the minimum limits specified by ASME Code Table IWL-2521-1.

Based on its review, the staff finds the applicant's response to RAI 4.5-1 acceptable because it clarified that the use of a single horizontal hoop tendon surveillance group is consistent with the plant's original licensing basis, with ASME Code Section XI, Subsection IWL, dated 1998, and the staff guidance provided in RG 1.35. The staff's concern described in RAI 4.5-1 is resolved.

In RAI 4.5-2 dated April 10, 2007, the staff noted that LRA Table 4.5-2 states that the seven horizontal tendons forces at the first year surveillance were 1358.0 kips, 1359.0 kips, 1381.0 kips, 1409.0 kips, 1348.0 kips, 1422.0 kips, and 1387.0 kips. The staff finds that the average value of these seven tendons force is 1380.6 kips, which is different from the value of 1416 kips shown on LRA Figure 4.5-1. The staff requested that the applicant explain this discrepancy.

In its response dated May 9, 2007, the applicant explained that it used a lifetime log-linear regression analysis for all lift-off data to-date, which may differ from the mean value of early-life data.

Based on its review, the staff finds the applicant's response to RAI 4.5-2 acceptable as it provides one reasonable way to present this data. In addition, WCGS reconfirmed the log-linear regression analysis and provided revised plots that include scatter graphs of the lift-off data. The staff's concern described in RAI 4.5-2 is resolved.

In RAI 4.5-3 dated April 10, 2007, the staff noted that LRA Figure 4.5-1, note 4, states:

> The surveillance program predicted force lines were calculated per wire. The values plotted here assume 170 wires per tendon. Some tendons have fewer [wires] due to failure to meet acceptance criteria at installation, or due to removal for surveillance testing.

The staff finds that the predicted magnitude of force of that tendon, based on the assumption of 170 wires, would be higher than it should have been if the numbers of wires in a tendon is less than 170 due to failure during installation, or due to removal for surveillance testing. The staff requested that the applicant provides its basis for using the assumed 170 wires per tendon instead of using the actual numbers of wires to calculate the tendon force.

In its response dated May 9, 2007, the applicant stated that this note applied only to the IWL predicated force lines. The applicant also stated that the trend lines were calculated from the actual tendon lift-off forces, regardless of the number of effective wires per tendon.

Based on its review, the staff finds the applicant's response to RAI 4.5-3 acceptable because it clarified that the trend lines were adequately calculated from the actual tendon lift-off forces. The staff's concern described in RAI 4.5-3 is resolved.

In RAI 4.5-4 dated April 10, 2007, the staff requested that the applicant establish a new trend line for LRA Figure 4.5-1 with actual pre-stressed tendon force.

In its response dated May 9, 2007, the applicant stated that the trend lines were calculated from the actual tendon lift-off forces, although the IWL predicted forces lines were not. The applicant provided scatter graphs of the lift-off data with actual prestressed tendon force, and reconfirmed the adequacy of the log-linear regression analysis lift-off data (i.e., the trend line).

Based on its review, the staff finds the applicant's response to RAI 4.5-3 acceptable because it clarified that the trend lines were calculated from the actual tendon lift-off forces. In addition, the scatter graphs provided by the applicant reconfirmed the adequacy of the regression analysis. The staff's concern described in RAI 4.5-4 is resolved.

4.5.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of concrete containment tendon prestress in LRA Section A3.4. On the basis of its review of the USAR 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, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for concrete containment tendon prestress, 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 concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6 Containment Liner Plate, Polar Crane Bracket, and Penetration Load Cycles

The WCGS post-tensioned concrete containment vessel is designed to Bechtel Topical Report (BC-TOP)-5A Revision 3. It is poured against a steel membrane liner designed to BC-TOP-1, Revision 1, "Containment Building Liner Plate Design Report." No credit is taken for the liner for the pressure design of the containment vessel, but the liner and penetrations ensure the vessel is leak-tight, and its electrical, process, personnel access, and equipment hatch penetrations are part of the containment pressure boundary.

4.6.1 Absence of a TLAA for Containment Liner Plate, Polar Crane Bracket, and Containment Penetration Design (Except Main Steam Penetrations)

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1 summarizes the evaluation of absence of a TLAA for containment liner plate, polar crane bracket, and containment penetration design (except main steam penetrations) for the period of extended operation. The liner plate is a gas-tight barrier to prevent uncontrolled release of fission products from the reactor building during operation and also in the unlikely event of an accident. SRP-LR Section 4.6.1 notes that in some designs, "fatigue of the liner plates or metal containments may be considered in the design based on an assumed number of loading cycles for the current operating term"; however, with the exception of the main steam penetrations, the containment liner and penetrations were designed to stress limit criteria independent of the number of load cycles and with no fatigue analyses. The liner plate design considers creep and shrinkage, prestress combined with concrete creep and shrinkage; and deadload, earthquake, wind, tornado, hydrostatic, vacuum, pressure, and thermal loads. The applicant's containment design specification invokes Bechtel containment design topical report BC-TOP-5A. Neither of these documents nor the ASME Code editions and addenda invoked by them impose an analysis for cyclic loading to other than quasi-static stress criteria. Although the containment design specification includes cyclic loads, it does not specify their number nor supply fatigue or other time-dependent design criteria. The BC-TOP-1 design report for the liner plate reports no fatigue analysis nor any other design for a stated number of cyclic loads or events for the liner or for its anchors or embedments. BC-TOP-1, Part II, does include cyclic design of the main steam penetrations.

The polar crane is supported on a system of girders supported by a series of brackets supported by the containment structure. BC-TOP-1, Revision 1, reviews the design of these brackets but reports no fatigue analysis nor any other design for a stated number of crane lifts, cyclic loads, or other events for the polar crane brackets. A thorough search of the licensing basis and review of the design documents for the containment liner and polar crane brackets found no evidence of any TLAAs applicable to penetrations except for the main steam penetration design. The containment penetrations include no bellows or expansion joints with TLAA-supported design.

4.6.1.2 Staff Evaluation

The staff reviewed LRA Section 4.6 to evaluate the absence of a TLAA for the containment liner plate, polar crane bracket, and containment penetration design. The containment at WCGS was designed by Bechtel according to topical reports BC-TOP-5A and BC-TOP-1. The staff agrees with the applicant that neither of these documents, nor the ASME Code editions and addenda invoked by them, impose an analysis for cyclic loading to other than the quasi-static stress criteria. Although the containment design specification includes cyclic loads, it does not specify their number nor supply fatigue or other time-dependent design criteria. The BC-TOP-1 design report does not contain fatigue analysis for the liner plate nor any other design report for a stated number of cyclic loads or events for the liner, or for its anchors or embedments.

4.6.1.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of absence of a TLAA for containment liner plate, polar crane bracket, and containment penetration design (except main steam penetrations) in LRA Section A3.5. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address absence of a TLAA for containment liner plate, polar crane bracket, and containment penetration design (except main steam penetrations) is adequate.

4.6.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant's evaluation of the absence of a TLAA for the containment liner plate, polar crane bracket, and containment penetration design (except main steam penetrations) for the period of extended operation is adequate. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.6.2 Design Cycles for the Main Steam Line Penetrations

4.6.2.1 Summary of Technical Information in the Application

LRA Section 4.6.2 summarizes the evaluation of design cycles for the main steam line penetrations for the period of extended operation. The main steam penetrations are designed for cyclic loads. BC-TOP-1 includes 100 lifetime steady state operating-thermal-gradient-plus-normal-operating-cyclic loads (i.e., Loading Condition V) and 10 steady state operating-thermal-gradient-plus-steam-pipe-rupture-cyclic loads (i.e., Loading Condition IV). The BC-TOP-1 analysis of effects of Loading Condition IV and V cyclic loads does not calculate a usage factor but uses a simplified ASME Code Section III, Subparagraph NB-3228.3, elastic-plastic analysis to compare the maximum allowed alternating stress range to the calculated maximum alternating stress intensity.

The LRA states that the original number of thermal cycles assumed for the main steam line penetrations is adequate for the period of extended operation and there is more than sufficient margin in the design for any possible increase in operating cycles above the original estimate. The design of the main steam penetrations is therefore valid for the period of extended operation.

4.6.2.2 Staff Evaluation

The staff reviewed LRA Section 4.6.2 to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

During an audit, the staff noted that LRA Section 4.6 states that LRA Table 4.3-1, item 1, shows only 27 startup cycles in the 19 years through 2004, and projects about 62 in 60 years. The staff requested that the applicant provide its technical justification for this statement provided under the Loading Condition V discussion.

In its response, the applicant indicated that its LRA amendment dated June 1, 2007, removed the 60-year projection column from LRA Table 4.3-1. The applicant stated that LRA Section 4.6.2 will be amended to provide the following estimate and analysis.

> The BC-TOP-1 "Containment Building Liner Plate Design Report" addresses cycle loading of the main steam penetrations. BC-TOP-1 Loading condition V is directly dependent on startup-shutdown cycles, which, from experience, are a constant multiplier of two per refueling cycle. WCGS currently refuels on 18-month cycles, and expects about 42 refuelings before the end of the extended period of operation, or about 85 startup-shutdowns cycles at two per refueling. In the 19

years of operation through 2004, WCGS has 27 startup cycles, which also indicates that about 85 might occur in a 60-year operating life. Therefore, the design basis assumption of 100 full-range thermal cycles (BC-TOP-1 Condition V events) should be adequate.

The number of assumed BC-TOP-1 condition IV events does not change with licensed life. The design basis equivalent usage factor for the 10 assumed condition IV events is 0.270. The design basis equivalent usage factor for the 100 assumed Condition V events is 0.028. Up to 2500 Condition V events would then result in an equivalent usage factor of only 0.270 + 25.0 x 0.028 = 0.970 < 1.000.

The staff reviewed the applicant's response and finds that the analysis showed a calculated usage factor near the 1.0 limit. However, the staff finds that some margin will be available even if the design basis number of events were reached for some events of a set. This is justified because the analysis assumes a higher number of DBEs.

In addition, by letter dated August 9, 2007, the applicant amended the LRA to incorporate these changes. The staff finds that the calculations will remain valid during the period of extended operation in accordance with 10 CFR 54.21(c)(i).

4.6.2.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of design cycles for the main steam line penetrations in LRA Section A3.5. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address design cycles for the main steam line penetrations is adequate.

4.6.2.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for design cycles for the main steam line penetrations, the analyses remain valid for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Plant-Specific Time-Limited Aging Analyses

LRA Section 4.7 summarizes the evaluation of the following plant-specific TLAAs:

- containment polar crane, fuel building cask handling crane, spent fuel pool bridge crane, and fuel handling machine Crane Manufacturers Association of America Specification No. 70 (CMAA-70) load cycle limits
- absence of a TLAA for reactor vessel underclad cracking analyses
- absence of a TLAA in a reactor coolant pump flywheel fatigue crack growth analysis

4.7.1 Containment Polar Crane, Fuel Building Cask Handling Crane, Spent Fuel Pool Bridge Crane, and Fuel Handling Machine CMAA-70 Load Cycle Limits

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1 summarizes the evaluation of containment polar crane, fuel building cask handling crane, spent fuel pool bridge crane, and fuel handling machine CMAA-70 load cycle limits for the period of extended operation. USAR Section 9.1.4 and licensing correspondence describe design of these lifting machines to CMAA-70. The CMAA-70 crane service classification for each machine depends in part on the assumption that the number of stress cycles at or near the maximum allowable stress will not exceed the number assumed for that design class. In operation, this assumption means the number of lifts which approach or equal the design load (significant lifts) will not exceed the number of stress cycles assumed for that design class. The design of cranes for these standard numbers of lifts for the plant lifetime is therefore a TLAA. The design standard number of full-capacity lifts far exceeds the number expected of each machine for a the period of extended operation. The lifting machine designs therefore remain valid for the period of extended operation.

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.

The staff finds that CMAA-70 Class A and B cranes are designed for 20,000 to 100,000 full-capacity lifts in a design life, and Class C cranes for 100,000 to 500,000 lifts. LRA Table 4.7-1 shows that 487 is the estimate of significant lifts for the polar crane lifetime. The polar crane is a CMAA-70 Class C crane which is rated for 500,000 lifetime heavy lifts.

The staff reviewed the polar crane overload evaluation which identified that there was one single overload event performed during Refueling Outage 13. The overload evaluation determined that stresses were well within the elastic range of all critical elements. On the basis that the design lifts far exceeds the number of expected lifts and that one single overload event had no significant effect on the margin of safety of the polar crane, the staff finds that the applicant has demonstrated that the polar crane design remains valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

The applicant estimated that the gate movements in the fuel storage pool and the 16,800 fuel handling lifts per fuel handling machine add about 100 lifetime lifts to the spent fuel bridge crane. On the basis that these machines will experience only a fraction of its rate lifetime number of lifts, as identified in CMAA-70, the staff finds that the applicant has demonstrated that the fuel handling machine design remains valid for the period of extended operation, in accordance with 10 CFR 54.21(c)(1)(i).

4.7.1.3 USAR Supplement

The applicant provided a USAR supplement summary description of its TLAA evaluation of containment polar crane, fuel building cask handling crane, spent fuel pool bridge crane, and fuel handling machine CMAA-70 load cycle limits in LRA Section A3.6.1. On the basis of its review of the USAR supplement, the staff concludes that the summary description of the applicant's actions to address containment polar crane, fuel building cask handling crane, spent fuel pool bridge crane, and fuel handling machine CMAA-70 load cycle limits is adequate.

4.7.1.4 Conclusion

On the basis of its review, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that for containment polar crane, fuel building cask handling crane, spent fuel pool bridge crane, and fuel handling machine CMAA-70 load cycle limits, the analyses remain valid for the period of extended operation. The staff also concludes that the USAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Absence of a TLAA for Reactor Vessel Underclad Cracking Analyses

4.7.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2 summarizes the evaluation of absence of a TLAA for reactor vessel underclad cracking analyses for the period of extended operation. WCAP-15338-A reports a generic 60-year flaw growth analysis which assumes 1.5 times the number of 40-year design basis cycles and finds the maximum flaw predicted by the crack growth analysis less than the ASME Code Section XI allowable flaw size, demonstrating that these effects are acceptable for the period of extended operation. The NRC safety evaluation of this topical report determined that it may be incorporated by reference in an LRA if the analysis applies to the applicant's plant. WCAP-15338-A applies to WCGS. The cyclic and transient load assumptions of this topical report bound those expected in the vessel for the period of extended operation. If invoked, WCAP-15338-A therefore would be valid for the period of extended operation. As these analyses qualify vessels for the extended 60-year rather than the current 40-year operating term, they are not TLAAs based on 10 CFR 54.3(a) criterion 3. The Metal Fatigue of Reactor Coolant Pressure Boundary Program will ensure either that the assumed number of cyclic and transient events is not exceeded or that appropriate reevaluation or other corrective action is taken if a design-basis number of events is exceeded. Cyclic and transient loadings that might affect growth of underclad cracking in the vessel will thereby be managed for the period of extended operation.

4.7.2.2 Staff Evaluation

The staff reviewed WCAP-15338-A. On the basis that the cyclic and transient load assumptions of this topical report bound those expected in the vessel and vessel geometry of a typical Westinghouse 4-loop vessel design, the staff concludes that WCAP-15338-A is applicable to WCGS. The staff confirms that WCAP-15338-A reports a generic 60-year flaw growth analyses and demonstrates the aging effects are acceptable. On the basis that these analyses qualify for the 60-year rather than the current 40-year operating term, the staff agrees that these analyses would not be TLAAs as described in 10 CFR 54.3(a)(3). The staff agrees that the existing analyses are validated for the period of extended operation.

4.7.2.3 USAR Supplement

On the basis of its review, the staff determines that the reactor vessel underclad cracking analyses is not a TLAA; therefore, an USAR supplement is not required.

4.7.2.4 Conclusion

On the basis of its review, the staff concludes that the reactor vessel underclad cracking analyses is not a TLAA. In addition, the staff determines that an USAR supplement is not required.

4.7.3 Absence of a TLAA in a Reactor Coolant Pump Flywheel Fatigue Crack Growth Analysis

4.7.3.1 Summary of Technical Information in the Application

LRA Section 4.7.3 summarizes the evaluation of absence of a TLAA in a reactor coolant pump flywheel fatigue crack growth analysis for the period of extended operation. Based on the definition of TLAA in 10 CFR 54.3(a), neither the risk assessment nor the supporting crack growth analysis is a TLAA because (1) these analyses support a 20-year inspection interval rather than a qualified design life and (2) the fatigue crack growth analysis is for a 60-year period rather than for the term of the current operating license. WCGS License Amendment 153 extended the surveillance interval for the flywheels to 20 years based on Westinghouse Topical Report WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination," which is based on RG 1.174 risk assessment methods. The staff accepted WCAP-15666 for use in license applications for technical specification improvements. The supporting WCAP-15666, Section 2, fatigue crack growth analysis assumes an initial flaw from a flywheel bore keyway equal to 10 percent of the keyway-to-outer-radius dimension and demonstrates that 6000 start-stop cycles (over an assumed 60-year life) produce only about an 80-mil extension of the crack. As this evaluation was based on the extended rather than the current licensed operating period, it is not a TLAA. Though not a TLAA, the 60-year crack growth analysis supported this licensing amendment permitting a 20-year surveillance interval during the current 40-year licensed operating period. The question remains whether the assumptions of this analysis for a 60- year licensed operating period are valid at WCGS. The applicant stated that the answer depends only on a demonstration that pumps will experience fewer than 6000 start-stop cycles during the period of extended operation.

The applicant now refuels on 18-month cycles. Refueling Outage 14 was performed in mid-2005. The applicant therefore expects about 41 or 42 refueling outages in 60 years. The forced outage history through early 2005 (20 years of operation) includes 70 events, of which only about 50 required a pump restart. Recent capacity factors have exceeded 90 percent. A conservative estimate therefore would require no more than about three pump stop-start cycles per year for forced outages plus about two per refueling outage or about 165 in a 60-year life. As many as 10 per fuel cycle would require only about 400 in a 60-year life. Furthermore, pumps usually are rebuilt at least every 15 to 20 years, and the present 20-year inspection interval and inspection methods ensure detection of any incipient flaws long before they might reach critical size.

4.7.3.2 *Staff Evaluation*

The staff reviewed WCAP-15666 and confirmed that 6000 cycles of RCP starts and stops were assumed for a 60-year plant life in the fatigue crack growth evaluation. The staff also reviewed WCGS operating history and determined that 6000 design cycles of RCP starts and stops far exceeds the actual operating cycles of RCP starts and stops. On the basis that the fatigue crack growth evaluation qualify for the 60-year rather than the current 40-year operating term, the staff agrees that the fatigue crack growth evaluation would not be TLAAs as described in 10 CFR 54.3(a)(3). The staff determines that the existing analysis is valid for the period of extended operation.

4.7.3.3 *USAR Supplement*

On the basis of its review, the staff determines that the RCP flywheel fatigue crack growth analysis is not a TLAA; therefore, an USAR supplement is not required.

4.7.3.4 *Conclusion*

On the basis of its review, the staff concludes that the RCP flywheel fatigue crack growth analysis is not a TLAA. In addition, the staff determines that an USAR supplement is not required.

4.8 Conclusion for Time-Limited Aging Analyses

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 required by 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) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the USAR supplement for the TLAAs and finds that the supplement contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no additional plant-specific, TLAA-based exemptions beyond what is described in the LRA are in effect.

With regard to these matters, the staff concludes that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and 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) has reviewed the license renewal application (LRA) for Wolf Creek Generating Station (WCGS).

On March 5, 2008, the applicant presented its LRA, and the NRC staff, including Region IV personnel, presented its review findings, as contained in the safety evaluation report (SER) with open items dated February 1, 2008, to the ACRS Plant License Renewal Subcommittee.

On September 4, 2008, the applicant presented its LRA, and the NRC staff, including Region IV personnel, presented its review findings, as contained in the final SER dated July 29, 2008, to the ACRS Plant License Renewal Full Committee.

During the 555th meeting of the ACRS on September 4-5, 2008, the ACRS completed its review of the WCGS LRA and the staff SER. The ACRS documented its findings in a letter to the Commission dated September 17, 2008. A copy of this letter is provided on the following pages of this SER Section.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 – 0001

September 17, 2008

The Honorable Dale E. Klein
Chairman
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: REPORT ON THE SAFETY ASPECTS OF THE LICENSE RENEWAL APPLICATION FOR THE WOLF CREEK GENERATING STATION, UNIT 1

Dear Chairman Klein:

During the 555th meeting of the Advisory Committee on Reactor Safeguards (ACRS), September 4-5, 2008, we completed our review of the license renewal application for the Wolf Creek Generating Station (WCGS), Unit 1, and the final Safety Evaluation Report (SER) prepared by the NRC staff. Our Plant License Renewal Subcommittee also reviewed this matter during its meeting on March 5, 2008. During these reviews, we had the benefit of discussions with the NRC staff and the applicant, Wolf Creek Nuclear Operating Corporation (WCNOC). We also had the benefit of the documents referenced. This report fulfills the requirement of 10 CFR 54.25 that the ACRS review and report on all license renewal applications.

CONCLUSION AND RECOMMENDATION

- The programs established and committed to by the applicant to manage age-related degradation provide reasonable assurance that WCGS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public.

- The WCNOC application for renewal of the operating license for WCGS should be approved.

BACKGROUND AND DISCUSSION

WCGS is a Westinghouse 4-loop pressurized water reactor with a large dry containment located approximately 3.5 miles northeast of Burlington, Kansas. The current licensed power rating of WCGS is 3565 megawatts thermal with a gross electrical output of approximately 1228 megawatts. WCNOC requested renewal of the WCGS operating license for 20 years beyond the current license term, which expires on March 11, 2025.

In the final SER, the staff documented its review of the license renewal application and other information submitted by the applicant or obtained from the staff audits and an inspection at the plant site. The staff reviewed the completeness of the applicant's identification of the Structures, Systems, and Components (SSCs) that are within the scope of license renewal; the integrated plant assessment process; the applicant's identification of the plausible aging mechanisms associated with passive, long-lived components; the adequacy of the applicant's Aging Management Programs (AMPs); and identification and assessment of Time-Limited Aging Analyses (TLAAs) requiring review.

In the WCGS license renewal application, WCNOC identified the SSCs that fall within the scope of license renewal. Based on this review, the applicant will implement 39 AMPs for license renewal comprised of 32 existing programs, 13 of which have been enhanced, and 7 new programs.

The WCGS application either demonstrates consistency with the Generic Aging Lessons Learned (GALL) Report or documents deviations to the specified approaches in this Report. The WCGS application includes 15 exceptions to the GALL Report. We reviewed these exceptions and agree with the staff that they are acceptable. Other recent license renewal applications have contained a number of exceptions to the GALL Report, which, upon review, have been found acceptable. The staff agrees that future updates of the GALL Report should incorporate alternative approaches which are used by the industry and have been previously approved by the staff. These proposed efforts will reduce the number of exceptions to the GALL Report in future applications and will facilitate the staff's review.

The staff conducted license renewal audits and an inspection at WCGS. The audits verified the appropriateness of the scoping and screening methodology, AMPs, aging management review, and TLAAs. The site inspection verified that the license renewal requirements are appropriately implemented. Based on the audits and inspection, the staff concludes in the SER that the proposed activities will manage the effects of aging of SSCs identified in the application and that the intended functions of these SSCs will be maintained during the period of extended operation. We agree with this conclusion.

As a result of the staff's review of the WCGS and other recent license renewal applications, the staff issued draft Regulatory Information Summary (RIS), 2008-xx, "Fatigue Analysis of Nuclear Power Plant Components," for public comment. This draft RIS identifies instances where a simplified fatigue analysis methodology can lead to a non-conservative result. This simplified methodology is not consistent with the methodology described in the American Society of Mechanical Engineers (ASME) Code, Section III, Subarticle NB-3200. In response to the staff's Requests for Additional Information (RAIs), the applicant performed confirmatory analyses for the hot leg surge line nozzle and charging nozzles.

The results of the confirmatory analyses indicated that the calculated Cumulative Usage Factors (CUFs) for these components, based on the simplified methodology, are conservative as compared to results based on the ASME NB-3200 methodology. However, there are two issues not currently fully analyzed, both relate to thermally induced cyclic metal fatigue. To resolve the first metal fatigue issue, the applicant has committed to update the count of thermal cycles for the early years of plant operation, during which thermal cycle counts were not collected in a systematic and rigorous manner. Regarding the second issue, the applicant has recently determined that a thermal sleeve is not present in the charging nozzle as assumed in a previously submitted analysis. The applicant is in the process of performing a reanalysis, which is consistent with the commitment documented in the final SER. Through these license renewal commitments, the applicant will perform the required fatigue analyses in a conservative manner and in sufficient time to permit thorough staff review and approval of these analyses prior to the start of the extended period of operation.

The applicant identified the systems and components requiring TLAAs and reevaluated them for the period of extended operation. The staff concluded that the applicant has provided an adequate list of TLAAs. Further, the staff has concluded that, in all cases, the applicant has met the requirements of the License Renewal Rule by demonstrating that the TLAAs will remain valid for the period of extended operation, or that the TLAAs have been projected to the end of the period of extended operation, or that the aging effects will be adequately managed for the period of extended operation. We concur with the staff's conclusion that WCGS TLAAs have been properly identified and that the required criteria will be met for the period of extended operation.

We agree with the staff that there are no issues related to the matters described in 10 CFR 54.29(a)(1) and (a)(2) that preclude renewal of the operating license for WCGS. The programs established and committed to by WCNOC provide reasonable assurance that the WCGS can be operated in accordance with its current licensing basis for the period of extended operation without undue risk to the health and safety of the public. The WCNOC application for renewal of the operating license for WCGS should be approved.

Sincerely,

/RA/

William J. Shack
Chairman

<u>References</u>

1. Letter dated September 27, 2006, from Terry J. Garrett, WCNOC to U.S. Nuclear Regulatory Commission, transmitting the Application to Renew the Operating License of Wolf Creek Generating Station, Unit 1, (ML062770308).

2. U.S. Nuclear Regulatory Commission, "Safety Evaluation Report, Related to the License Renewal of Wolf Creek Generating Station," dated July 31, 2008, (ML082180210).

3. NRC Staff Audit Summary Report, dated February 14, 2008, (ML073310013).

4. NRC License Renewal Inspection Report 05000482/2007007, Wolf Creek Generating Station, dated December 5, 2007, (ML073390687).

5. NRC Draft Regulatory Issue Summary, 2008-xx, "Fatigue Analysis of Nuclear Power Plant Components," dated April 11, 2008, (ML080950235).

6. U.S. Nuclear Regulatory Commission, NUREG-1801, Volumes 1 & 2, Rev 1, "Generic Aging Lessons Learned Report," September 2005.

SECTION 6

CONCLUSION

The staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) reviewed the license renewal application (LRA) for Wolf Creek Generating Station, Unit 1, 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)" and Supplement 32, "Generic Environmental Impact Statement for License Renewal Plants Regarding Wolf Creek Generating Station," dated May 2008.

APPENDIX A

WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS

During the review of the Wolf Creek Generating Station (WCGS), Unit 1, license renewal application (LRA) by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff), Wolf Creek Nuclear Operating Corporation (WCNOC or 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.

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
(1)	Prior to the period of extended operation, procedures will be enhanced to state that susceptible components adjacent to potential leakage sources will include electrical components and connectors.	A1.4	March 11, 2025	ET 06-0038
(2)	Prior to the period of extended operation, procedures will be enhanced to indicate that detection of leakage or evidence of cracking in the vessel head penetration nozzles or associated welds will cause an immediate reclassification to the "High" susceptibility ranking, commencing from the same outage in which the leakage or cracking is detected.	A1.5	March 11, 2025	ET 06-0038
(3)	Prior to the period of extended operation, a new periodic preventive maintenance activity will be developed to specify performing inspections of the internal surfaces of valve bodies and accessible piping while the valves are disassembled for operational readiness inspections to detect loss of material and fouling. The acceptance criteria will be specified in this Preventive Maintenance activity.	A1.10	March 11, 2025	ET 06-0038 ET 07-0020

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(4)	Prior to the period of extended operation, procedures will be enhanced to: (1) identify industry standards or Wolf Creek Generating Station (WCGS) specifications that are applicable to the component, and (2) specifically inspect for loss of material due to corrosion or rail wear.	A1.11	March 11, 2025	ET 06-0038
(5)	Prior to the period of extended operation: (1) fire damper inspection and drop test procedures will be enhanced to inspect damper housing for signs of corrosion, (2) fire barrier and fire door inspection procedures will be enhanced to specify fire barriers and doors described in USAR Appendix 9.5A, 'WVCGS Fire Protection Comparison to APCSB 9.5-1 Appendix A," and WCGS Fire Hazards Analysis, (3) training for technicians performing the fire door and fire damper visual inspection will be enhanced to include fire protection inspection requirements and training documentation, and (4) halon fire suppression system inspection procedures will be enhanced to include visual inspection of halon tank flexible hoses (that do not have scheduled periodic replacement intervals) for hardening - loss of strength.	A1.12	March 11, 2025	ET 06-0038 ET 07-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(6)	Prior to the period of extended operation: (1) the emergency fuel oil day tanks will be added to the ten-year drain, clean, and internal inspection program, and (2) procedures will be enhanced to provide for supplemental ultrasonic thickness measurements if there are indications of reduced cross sectional thickness found during the visual inspection of the emergency fuel oil storage tanks. A one time ultrasonic (UT) or pulsed eddy current (PEC) thickness examination on the external surface of engine driven fire pump fuel oil tank (1 DO002T) will be performed to detect corrosion related wall thinning. If UT is used, the examination will be on a 4 inch grid. The examination will be performed once between 10 and 2 years prior to the period of extended operation.	A1.14	March 11, 2025	ET 06-0038 ET 07-0020
(7)	The One-Time Inspection program conducts one-time inspections of plant system piping and components to verify the effectiveness of the Water Chemistry program (A1.2), Fuel Oil Chemistry program (A1.14), and Lubricating Oil Analysis program (A1.23).This new program will be implemented and completed within the ten-year period prior to the period of extended operation.	A1.16	March 11, 2025	ET 06-0038
(8)	The Selective Leaching of Materials program is a new program that will be implemented prior to the period of extended operation.	A1.17	March 11, 2025	ET 06-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(9)	The Buried Piping and Tanks Inspection program is a new program that will be implemented prior to the period of extended operation. Within the ten-year period prior to entering the period of extended operation, an opportunistic or planned inspection will be performed. Upon entering the period of extended operation a planned inspection within ten years will be required unless an opportunistic inspection has occurred within this ten-year period.	A1.18	March 11, 2025 and once within 10-years of entering period of extended operation	ET 06-0038
(10)	The fourth interval of the ISI program at WCGS will provide the results for the one-time-inspection of ASME Code Class 1 small-bore piping.	A1.19	March 11, 2025	ET 06-0038
(11)	The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is a new program that will be implemented prior to the period of extended operation. For those systems or components where inspections of opportunity are insufficient, an inspection will be conducted prior to the period of extended operation to provide reasonable assurance that the intended functions are maintained.	A1.22	March 11, 2025	ET 06-0038
(12)	The Electrical Cables and Connections Not Subject to 10 CFR50.49 Environmental Qualification Requirements program is a new program that will be implemented prior to the period of extended operation.	A1.24	March 11, 2025	ET 06-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(13)	A review of the calibration surveillance test results will be completed before the period of extended operation and every 10 years thereafter.	A1.25	March 11, 2025 and every 10 years thereafter	ET 06-0038
(14)	The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program is a new program that will be implemented prior to the period of extended operation.	A1.26	March 11, 2025	ET 06-0038
(15)	Prior to the period of extended operation, procedures will be enhanced to include two new provisions regarding inspection of repair/replacement activities. The 2001Edition with 2002 and 2003 addenda of ASME Code Section XI, Subsection IWL, Article IWL-2000, includes two provisions that are not required by the 1998 edition. IWL-2410(d) specifies additional inspections for concrete surface areas affected by a repair/replacement activity, and IWL-2521.2 specifies additional inspections for tendons affected by a repair/replacement activity. In accordance with 10 CFR 50.55a, WCGS will revise their CISI program prior to the next inspection interval to incorporate the ASME Code edition and addenda incorporated into 10 CFR 50.55a at that time.	A1.28	March 11, 2025	ET 06-0038 ET 07-0020
(16)	Prior to the period of extended operation, procedures will be enhanced to identify un-reinforced masonry in the Radwaste Building within the scope of license renewal that requires aging management.	A1.31	March 11, 2025	ET 06-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(17)	Prior to the period of extended operation, procedures will be enhanced to add inspection parameters for treated wood and to monitor groundwater for pH, sulfates, and chlorides. Two samples of groundwater will be tested every five years.	A1.32	March 11, 2025	ET 06-0038 ET 07-0020
(18)	Prior to the period of extended operation, procedures will be enhanced: (1) so that the main dam service spillway and the auxiliary spillway will be inspected in accordance with the same specification, (2) to clarify the scope of inspections for the spillways, (3) to add the 5-year inspection frequency for the main dam service spillway, and (4) to add cavitation to the list of concrete aging effects for surfaces other than spillways.	A1.33	March 11, 2025	ET 06-0038
(19)	WCNOC will: A. Reactor Coolant System Nickel Alloy Pressure Boundary Components. Implement applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, (4) upon completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor coolant system nickel alloy pressure boundary components to the NRC for review	A1.35	March 11, 2023	ET 06-0038 ET 07-0033 WM 08-0019

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
	and approval, and B. Reactor Vessel Internals (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, WCNOC will submit an inspection plan for reactor internals to the NRC for review and approval.			
(20)	Prior to the period of extended operation: (1) the infrared thermography testing procedure will be enhanced to require an engineering evaluation when test acceptance criteria are not met. This engineering evaluation will include identifying the extent of condition, the potential root cause for not meeting the test acceptance, and the likelihood of recurrence, and (2) A one-time inspection of a representative sample of low voltage, low current, or low load connections will be performed.	A1.36	March 11, 2025	ET 06-0038 ET 07-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(21)	Prior to the period of extended operation, the Metal Fatigue of Reactor Coolant Pressure Boundary program will be enhanced to include: 1) Cycle Count Action Limit and Corrective Actions. An action limit will be established that requires corrective action when the cycle count for any of the critical thermal and pressure transients is projected to reach a high percentage (e.g., 90%) of the design specified number of cycles before the end of the next fuel cycle. If this action limit is reached, acceptable corrective actions include: 1. Review of fatigue usage calculations: • To determine whether the transient in question contributes significantly to CUF • To identify the components and analyses affected by the transient in question • To ensure that the analytical bases of the leak-before-break (LBB) fatigue crack propagation analysis and of the high-energy line break (HELB) locations are maintained 2. Evaluation of remaining margins on CUF based on cycle-based or stress-based CUF calculations using the WCGS fatigue management program software. 3. Redefinition of the specified number of cycles (e.g., by reducing specified numbers of cycles for other transients and using the margin to increase the allowed number of cycles for the transient that is approaching its specified number of cycles).	A2.1	March 11, 2025	ET 06-0038 ET 07-0031 ET 07-0037 ET 07-0046

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
	2) Cumulative Fatigue Usage Action Limit and Corrective Actions. An action limit will be established that requires corrective action when calculated CUF (from cycle based or stress based monitoring) for any monitored location is projected to reach 1.0 within the next 2 or 3 fuel cycles. If this action limit is reached, acceptable corrective actions include: 1. Determine whether the scope of the monitoring program must be enlarged to include additional affected reactor coolant pressure boundary locations. This determination will ensure that other locations do not approach design limits without an appropriate action. 2. Enhance fatigue monitoring to confirm continued conformance to the code limit. 3. Repair the component. 4. Replace the component. 5. Perform a more rigorous analysis of the component to demonstrate that the design code limit will not be exceeded. 6. Modify plant operating practices to reduce the fatigue usage accumulation rate. 7. Perform a flaw tolerance evaluation and impose component-specific inspections, under ASME Code Section XI Appendices A or C (or their successors), and obtain required approvals by the NRC. Corrective action limits for cumulative fatigue usage will be			

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
	assure that sufficient margin is maintained to allow one cycle of the highest fatigue usage per cycle transient to occur without exceeding CUF = 1.0. (This includes consideration of environmental effects for NUREG/CR6260 locations). This may require that corrective action is taken more than 2 or 3 fuel cycles before CUF is projected to exceed 1.0. This is because the projections will be based on historical experience, which is not expected to include many of the low probability design transients. The low probability design transients to be used in the evaluation will include: * Aux. Spray Actuation, Spray Water Diff.>320F * Excessive Feedwater Flow * Reactor Trip - Cooldown with no SI * COMS * Reactor Trip - No Inadvertent Cooldown with Turbine Over-speed * Reactor Trip - Cooldown with SI * Inadvertent RCS Depressurization * Accumulator Safety Injection * Operating Basis Earthquake 3) 10 CFR 50 Appendix B procedural and record requirements. [Prior to the period of extended operation, changes in available monitoring technology or in the analyses themselves may permit different action limits and action statements, or may re-define the program features and			

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
	actions required to address fatigue time-limited aging analyses. (TLAAs)]			
(22)	DELETED	DELETED	DELETED	ET 06-0038 ET 07-0020
(23)	Prior to the period of extended operation, procedures will be revised to: (1) extend the list of surveillance tendons to include random samples for the year 40, 45, 50, and 55-year surveillances, (2) explicitly require a regression analysis for each tendon group after every surveillance, (3) invoke and describe regression analysis methods used to construct the lift-off trend lines, (4) extend surveillance program predicted force lines for the vertical and hoop tendon groups to 60 years, and (5) conform procedure descriptions of acceptance criteria action levels to the ASME Code, Subsection IWL 3221 descriptions.	A2.3	March 11, 2025	ET 06-0038
(24)	WCNOC will obtain a design report amendment to either quantify the increase in high-cycle fatigue effects, or to confirm that the increase will be negligible. WCNOC will complete this action before the end of the current licensed operating period.	A3.2.2	COMPLETED	ET 06-0038
(25)	WCNOC will complete the reanalysis of the reactor coolant sample lines and any additional corrective actions or modifications indicated by them, before the end of the current licensed operating period.	A3.2.4	COMPLETED	ET 06-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
(26)	Following issuance of the renewed operating license in accordance with 10 CFR 50.71(e), WCNOC will incorporate the USAR supplement into the WCGS USAR as required by 54.21(d).	A0	USAR update following issuance of the renewed operating license in accordance with I0 CFR50.71(e).	ET 06-0038 ET 07-0020
(27)	WCNOC will revise the Pressure and Temperature Limits Report for a 60-year licensed operating life.	A3.1.3	March 11, 2025	ET 06-0038
(28)	Implementation of new programs may require additional action items not included in this list. WCGS is committed to including new program elements in the corrective action program.		March 11, 2025	ET 06-0038
(29)	License Renewal Application changes discussed in this document ET 07-0011 will be submitted in an amendment to the application.		COMPLETED	ET 07-0011 ET 07-0025 ET 07-0038
(30)	The WCNOC Nickel Alloy Aging Management Program will be supplemented with implementation of applicable (1) NRC Orders, Bulletins and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines, (3) participate in the industry initiatives, such as owners group programs and the EPRI Materials Reliability Program, for managing aging effects associated with nickel alloys, (4) upon	A1.34	March 11, 2023	ET 07-0016 ET 07-0042 WM 07-0077

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	Commitment	USAR Supplement Section/ LRA Section	Enhancement or Implementation Schedule	Source
	completion of these programs, but not less than 24 months before entering the period of extended operation, WCNOC will submit an inspection plan for reactor coolant system nickel alloy pressure boundary components to the NRC for review and approval.			
(31)	License Renewal Application changes discussed in ET 07-0020 and ET 07-0031, Enclosure 1, will be submitted in an amendment to the Application.		COMPLETED	ET 07-0020 ET 07-0031 ET 07-0038
(32)	WCNOC Procedure QCP-20-518, "Visual System Examination of Heat Exchangers and (RCMS 2007-253) Piping Components," will be revised to define cracking, provide additional guidance for detection of cracking and specific acceptance criteria relating to "as found" cracking.		March 11, 2025	ET 07-0020
(33)	License Renewal Application changes discussed in WM 07-0050 will be submitted in an amendment to the application.		COMPLETED	WM 07-0050 ET 07-0038
(34)	License Renewal Application changes discussed in WM 07-0051 will be submitted in an amendment to the application.		COMPLETED	WM 07-0051 WM 07-0077
(35)	License Renewal Application changes discussed in ET 07-0028 will be submitted in an amendment to the application.		COMPLETED	ET 07-0028 ET 07-0038

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(36)	License Renewal Application changes discussed in ET 07-0031, Enclosure 2, will be submitted in an amendment to the Application.		COMPLETED	ET 07-0031 WM 07-0077
(37)	License Renewal Application changes discussed in RAI 2.1-2 Followup Response will be included in an amendment to the Application if determined to have LRA impact.		COMPLETED	ET 07-0033 ET 07-0038
(38)	Backward projection of CUF was used for NUREG/CR-6260 locations (Surge Line Hot Leg Nozzle, Charging Nozzles), and for several locations not covered by NUREG/CR -6260 locations (Pressurizer Lower Head, Pressurizer Spray Nozzle, Pressurizer Surge Nozzle, Pressurizer Surge Line, S/G Feedwater Nozzles). While the ratios used for back-projection do incorporate accumulated fatigue effects from all transients that occurred during PERIOD 2, it does not account for transients which occurred more frequently in PERIOD 1 than during PERIOD 2. Therefore, Wolf Creek will prepare an updated baseline that adequately bounds transients experienced prior to the start of CUF monitoring. The existing baseline CUF for all monitored locations will be increased to bound the potential CUF contribution from the transients that were under-represented in the existing baseline.		COMPLETED	ET 07-0046 ET 07-0037 WM 07-0077

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Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(39)	Pursuant to 10 CFR 54.21(b), Wolf Creek Nuclear Operating Corporation (WCNOC) has completed the annual review and is in the process of evaluating two changes to the Wolf Creek Generating Station (WCGS) current licensing basis (CLB) that may materially affect the content of the WCGS License Renewal Application (LRA), including the Updated Safety Analysis Report (USAR) supplement. WCNOC expects to complete this evaluation and if necessary submit any changes to the WCGS LRA.		COMPLETED	ET 07-0044 WM 07-0077 ET 07-0048
(40)	Validate the presence or absence of charging nozzle thermal sleeves. If WCNOC determines that the sleeves are not present, the analyses will be re-performed and the new analyses will be incorporated into the WCGS fatigue monitoring program.	A2.1	March 11, 2023	ET 08-0030 ET 08-0036

APPENDIX A: WCGS UNIT 1 LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**USAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
(41)	Backward projection of CUF was used in the WCGS fatigue monitoring program for NUREG/CR-6260 Locations (Surge Line Hot Leg Nozzle, and Charging Nozzles). While the ratios used for back-projection do incorporate accumulated fatigue effects from all transients that occurred during Period 2, it does not account for transients, which occurred more frequently in Period 1 than Period 2. Therefore, WCNOC will prepare a fatigue monitoring program updated baseline for the pressurizer hot leg surge nozzle based on the additional insurge/outsurge cycles accumulated in a pre-MOP environment. Additionally, WCNOC will update the fatigue monitoring program baseline for the charging nozzles with consideration for the differential contribution of fatigue for each category of charging event.	A2.1	March 11, 2023	ET 08-0030 ET 08-0036

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 Wolf Creek Nuclear Operating Corporation (WCNOC). This appendix also lists other correspondence on the staff's review of the Wolf Creek Generating Station (WCGS), Unit 1 license renewal application (LRA) (under Docket No. 50-482).

APPENDIX B: CHRONOLOGY	
Date	**Subject**
September 27, 2006	Transmittal of WCGS LRA (ADAMS Accession No. ML062770301)
September 27, 2006	WCGS LRA (ADAMS Accession No. ML062770308)
September 27, 2006	WCGS LRA Drawings (ADAMS Accession No. ML062770307)
September 27, 2006	WCGS LRA Environmental Report (ADAMS Accession No. ML062770305)
October 10, 2006	Press Release 06-127: NRC Announces Availability of LRA for WCGS, Unit 1 (ADAMS Accession No. ML062830270)
October 12, 2006	Receipt and Availability of the LRA for the WCGS, Unit 1 (ADAMS Accession No. ML062840512)
October 20, 2006	Summary of Meeting Held on September 20, 2006, Between The U.S. Nuclear Regulatory Commission (NRC) Staff and Strategic Teaming and Resource Sharing (STARS) Representatives to Discuss the WCGS LRA (ADAMS Accession No. ML062760407)
November 3, 2006	LRA for the WCGS, Unit 1 - Supplemental Information (ADAMS Accession No. ML063070581)
November 17, 2006	WCGS Supplementary Environmental Information to Support the LRA (ADAMS Accession No. ML063260283)
November 30, 2006	Determination of Acceptability and Sufficiency for Docketing, Proposed Review Schedule, and Opportunity for a Hearing Regarding the Application from WCNOC, for Renewal of the Operating License for WCGS (ADAMS Accession No. ML063240216)
November 30, 2006	Notice of Acceptance for Docketing of the Application, Notice of Opportunity for Hearing, and Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process for WCGS (ADAMS Accession No. ML063240237)

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Date	**Subject**
November 30, 2006	Forthcoming Public Meeting to Discuss the License Renewal Process and Environmental Scoping for WCGS, Unit 1, LRA Review (ADAMS Accession No. ML063240053)
December 5, 2006	Press Release 06-148: NRC Announces Opportunity to Request a Hearing on for the WCGS LRA (ADAMS Accession No. ML063390067)
December 12, 2006	Revised Forthcoming Meeting to Discuss the License Renewal Process and Environmental Scoping for WCGS, Unit 1, LRA Review (ADAMS Accession No. ML063460165)
December 12, 2006	Request for Additional Information (RAI) For the Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML063420403)
December 13, 2006	Press Release IV-06-027: NRC Staff To Hold Two Public Meetings To Discuss License Renewal Process For WCGS, Unit 1 (ADAMS Accession No. ML063470208)
January 11, 2007	WCNOC Response to RAI Regarding the Review of the LRA (ADAMS Accession No. ML070180367)
January 19, 2007	Summary of Public Meetings Held on December 19, 2007, Related to the Review of the WCGS LRA (ADAMS Accession No. ML070220041)
February 2, 2007	Summary of Conference Call Held on January 4, 2007, Between the NRC and WCNOC, Concerning the Upcoming Scoping and Screening Methodology Audit (ADAMS Accession No. ML070330525)
February 6, 2007	Audit and Review Plan for Plant Aging Management Reviews and Programs, WCGS (ADAMS Accession No. ML070230166)
April 3, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070710027)
April 3, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070930559)
April 4, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070710050)
April 9, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070930695)
April 9, 2007	Revision of Schedule for the Review of the WCGS, Unit 1, LRA (ADAMS Accession No. ML070930175)
April 10, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070930685)

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Date	**Subject**
April 11, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070800176)
April 11, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML070930659)
April 18, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML071000259)
May 2, 2007	WCGS, Response to RAI Related to LRA (ADAMS Accession No. ML071290058)
May 6, 2007	Summary of Telephone Conference Call Held on April 06, 2007 Between the NRC and WCNOC, Concerning Draft RAIs Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071220339)
May 6, 2007	Summary of Telephone Conference Call Held on March 06, 2007, Between the NRC and WCNOC, Concerning Draft RAIs Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071220212)
May 6, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML071220180)
May 7, 2007	Summary of Telephone Conference Call Held on March 07, 2007, Between the NRC and WCNOC, Concerning Draft RAIs Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071220191)
May 8, 2007	Summary of Telephone Conference Calls Held on March 20 and April 06, 2007, Between the NRC and WCNOC, Concerning Draft RAIs Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071220293)
May 8, 2007	Summary of Telephone Conference Call Held on April 10, 2007, Between the NRC and WCNOC, Concerning Draft RAIs Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071220365)
May 8, 2007	Summary of Telephone Conference Call Held on April 11, 2007, Between the NRC and WCNOC, Concerning Draft RAIs Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071240153)
May 9, 2007	WCNOC Response to RAI Related to the WCGS LRA (ADAMS Accession No. ML071360100)
May 10, 2007	WCNOC Response to RAI Related to the WCGS LRA (ADAMS Accession No. ML071380454)

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Date	**Subject**
May 16, 2007	Summary of Telephone Conference Call Held on March 7, 2007, Between the NRC and WCNOC, Concerning Draft RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071240214)
May 20, 2007	Summary of Telephone Conference Call Held on May 02, 2007 Between the NRC and WCNOC, Concerning Draft RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071240286)
May 22, 2007	Summary of Conference Call Held on March 7, 2007, Between the NRC and WCNOC, Concerning the Upcoming Safety Audit (ADAMS Accession No. ML071240256)
May 22, 2007	Summary of Telephone Conference Call Held on March 20, 2007, Between the NRC and WCNOC, Concerning Draft RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071240269)
May 25, 2007	WCNOC Response to RAI Related to the WCGS LRA (ADAMS Accession No. ML071500565)
June 1, 2007	WCNOC Response to RAI Related to the WCGS LRA (ADAMS Accession No. ML071580194)
June 1, 2007	WCGS LRA Amendment 1 (ADAMS Accession No. ML071580237)
June 7, 2007	WCNOC Time-Limited Aging Analysis Questions and Responses Related to WCGS LRA(ADAMS Accession No. ML071640384)
June 15, 2007	Summary of Telephone Conference Call Held on June 8, 2007, Between the NRC and WCNOC Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071640024)
June 22, 2007	RAI For The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML071730352)
June 25, 2007	Summary of Telephone Conference Call Held On June 14, 2007, Between the NRC and WCNOC, Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071690318)
June 25, 2007	Revision of Schedule for The Review of The WCGS, Unit 1, LRA (ADAMS Accession No. ML071710372)
June 27, 2007	WCNOC Revision to WCGS LRA Commitment Due Date (ADAMS Accession No. ML071840191)
June 27, 2007	Summary of Telephone Conference Call Held on May 15, 2007, Between the NRC and WCNOC Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071730415)

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Date	**Subject**
June 28, 2007	Summary of Telephone Conference Call Held on June 21, 2007, Between the NRC and WCNOC Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071780545)
July 9, 2007	Summary of Telephone Conference Call Held on June 13, 2007 Between the NRC and WCNOC Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML071780563)
July 11, 2007	WCNOC Followup Response to RAI Related to WCGS LRA (ADAMS Accession No. ML071990100)
July 18, 2007	WCNOC Revision to the RAI Response Due Date for the WCGS LRA (ADAMS Accession No. ML072050323)
July 24, 2007	RAI For The Review of The WCGS, Unit 1, LRA(ADAMS Accession No. ML072000324)
July 26, 2007	Commitment Extension Related to the WCGS, Unit 1, LRA (ADAMS Accession No. ML072000330)
July 26, 2007	WCNOC Followup Response to RAI Related to WCGS LRA (ADAMS Accession No. ML072150232)
July 26, 2007	WCNOC Response to RAI Related to WCGS LRA (ADAMS Accession No. ML072150241)
July 26, 2007	WCNOC Revision to the Aging Management Program, and Time-Limited Aging Analysis Questions and Responses Related to WCGS LRA (ADAMS Accession No. ML072180225)
August 8, 2007	WCNOC Followup Response to RAI Related to WCGS LRA (ADAMS Accession No. ML072280073)
August 9, 2007	WCGS LRA Amendment 2 (ADAMS Accession No. ML072280068)
August 20, 2007	WCNOC Response to RAI Related to WCGS LRA (ADAMS Accession No. ML072400403)
August 28, 2007	Summary of Telephone Conference Call Held on August 17, 2007, Between the NRC and WCNOC, Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML072320452)
August 31, 2007	WCGS LRA Amendment 3 (ADAMS Accession No. ML072490301)
September 4, 2007	Summary of Telephone Conference Call Held on August 17, and August 31, 2007, Between the NRC and WCNOC, Concerning RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML072320487)

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Date	**Subject**
September 19, 2007	Press Release IV-07-036: NRC to Hold Public Meetings on Draft Environmental Impact Statement for WCGS LRA (ADAMS Accession No. ML072620531)
September 26, 2007	Summary of Telephone Conference Call Held on September 26, 2007, Between the NRC and WCNOC, Concerning Draft RAI Pertaining to the WCGS, Unit 1, LRA (ADAMS Accession No. ML072700054)
September 27, 2007	RAI for the Review of the WCGS, Unit 1, LRA (ADAMS Accession No. ML072680037)
September 27, 2007	WCNOC Followup Response to RAI Related to WCGS LRA (ADAMS Accession No. ML072770010)
September 27, 2007	WCGS LRA Annual Update Information (ADAMS Accession No. ML072770009)
September 30, 2007	NUREG-1437, Supplement 32, Generic Environmental Impact Statement for the License Renewal of Nuclear Plants: Regarding Wolf Creek Generating Station, Draft for Comment. (ADAMS Accession No. ML072540026)
October 3, 2007	WCNOC Followup Response to RAI Related to WCGS LRA (ADAMS Accession No. ML072840051)
October 11, 2007	WCGS LRA Amendment 4 (ADAMS Accession No. ML072900637)
October 17, 2007	WCGS LRA Time-Limited Aging Analyses Supplemental Information (ADAMS Accession No. ML072970530)
October 17, 2007	WCNOC Response to RAI and Supplement to the WCGS LRA (ADAMS Accession No. ML072980026)
November 16, 2007	WCGS LRA Amendment 5 (ADAMS Accession No. ML073300457)
November 30, 2007	WCNOC Time-Limiting Aging Analysis Supplemental Information WCGS LRA (ADAMS Accession No. ML073460041
December 5, 2007	Wolf Creek Generating Station - NRC License Renewal Inspection Report 05000482/2007007 (ADAMS Accession No. ML073390687)
January 25, 2008	Wolf Creek - Followup Response to NRC Requests for Additional Information Related to License Renewal Application Time-Limited Aging Analysis (ADAMS Accession No. ML080350012)
February 14, 2008	Audit summary (ADAMS Accession No. ML073310013)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
February 28, 2008	Request for Additional Information for the Review of the Wolf Creek Generating Station (WCGS), License Renewal Application (ADAMS Accession No. ML080530067)
March 26, 2008	Revision to the Response Due Date for a Request for Additional Information for Wolf Creek Generating Station License Renewal Application Metal Fatigue Analysis (ADAMS Accession No. ML080930156)
March 29, 2008	Wolf Creek - License Renewal Application, Amendment 6 (ADAMS Accession No. ML081000123)
March 29, 2008	Wolf Creek, Response to Open Items Associated with the NRC Draft Safety Evaluation for the Application for License Renewal (ADAMS Accession No. ML081000124)
March 31, 2008	Schedule for Completion of Wolf Creek License Renewal Review (ADAMS Accession No. ML080840288)
April 1, 2008	Wolf Creek Generating Station - License Renewal Application Update Provided in Accordance with 10 CFR 54.21(b) (ADAMS Accession No. ML081000122)
April 17, 2008	Wolf Creek- Correction to Summary of License Renewal Application, Amendment 6 (ADAMS Accession No. ML081150508)
May 15, 2008	Docket No. 50-482: Response to NRC Requests for Additional Information Related to Wolf Creek Generating Station License Renewal Application - Closure of the Metal Fatigue Analysis Open Items (ADAMS Accession No. ML081440051)
May 23, 2008	Docket No. 50-482: Correction to Response to NRC Requests for Additional Information Related to Wolf Creek Generating Station License Renewal Application - Closure of the Metal Fatigue Analysis Open Items (ADAMS Accession No. ML081540472)
June 9, 2008	Docket No. 50-482: Supplement to Response to NRC Requests for Additional Information Related to Wolf Creek Generating Station License Renewal Application - Closure of the Metal Fatigue Analysis Open Items (ADAMS Accession No. ML081700279)
August 1, 2008	Docket No. 50-482: Documentation of Telephone Calls Associated to the Wolf Creek Generating Station License Renewal Application (ADAMS Accession No. ML082200317)
September 17, 2008	Report on the Safety Aspects of the License Renewal Application for the Wolf Creek Generating Station, Unit 1 (ADAMS Accession No. ML082540142)

APPENDIX C

PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors for the development of this safety evaluation report (SER) and their areas of responsibility.

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APPENDIX D

REFERENCES

This appendix lists the references used throughout this safety evaluation report (SER) for review of the license renewal application (LRA) for Wolf Creek Generating Station (WCGS), Unit 1.

APPENDIX D: REFERENCES	
Item Number	**Reference**
1	NUREG-1800, Revision 1, "Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants," September 2005.
2	NUREG-1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report," September 2005.
3	NEI 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule," June 2005.
4	NUREG-0800, Revision 1, "Standard Review Plan for the Review of Safety Analysis Report of Nuclear Power Plants," Section 3.6.2 Branch Technical Position 3-1, July 1981.
5	10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
6	10 CFR Part 52 "Early Site Permits; Standard Design Certifications; And Combined Licenses For Nuclear Power Plants."
7	10 CFR Part 54, "Requirements for Renewal of Operating Licenses For Nuclear Power Plants."
8	10 CFR Part 100, "Reactor Site Criteria."
9	NUREG/CR-6260, "Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components."
10	NUREG-0881, "Safety Evaluation Report related to the Operation of Wolf Creek Generating Station, Unit 1," April 1982.
11	NUREG/CR-5704, "Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels."
12	NUREG/CR-6583, "Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels."
13	Institute of Electrical and Electronics Engineers (IEEE) 344-1975, "Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."

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Item Number	**Reference**
14	NRC Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment," July 1989.
15	Wolf Creek Nuclear Operating Center Procedure QCP-20-318, "Visual Examination of Heat Exchangers and Piping Components."
16	Electric Power Research Institute (EPRI) Report TR-107514.
17	EPRI Report TR-105714,
18	EPRI Report TR-102134,
19	EPRI NP-5769, Volume 2, Section 10,
20	NRC Information Notice 92-8, "Potential Deficiency of Electrical Cables With Bonded Hyalon Jackets."
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23	NRC Order EA-03-009, "Issuance of Order Establishing Interim Inspection Requirements for Reactor Pressure Vessel Heads at Pressurized Water Reactors."
24	Bechtel Topical Report BC-TOP-5A Revision 3,
25	Bechtel Topical Report BC-TOP- 1 Revision 1, "Containment Building Liner Plate Design Report."
26	The Westinghouse Commercial Atomic Power (WCAP)-10691, "Technical Basis for Eliminating Large Primary Loop Pipe Rupture as a Structural Design Basis for Callaway and Wolf Creek Plants."
27	WCAP-16028, Revision 0, "Analysis of Capsule X from Wolf Creek Nuclear Operating Corporation, Wolf Creek Reactor Vessel Radiation Surveillance Program," March, 2003.
28	WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination."
29	WCAP-12893, "Structural Evaluation of the Wolf Creek and Callaway Pressurizer Surge Lines, Considering the effects of Thermal Stratification."
30	WCAP-14575-A, "Aging Management Evaluation for Class 1 Piping and Associated Pressure Boundary Components."
31	WCAP-15666, "Extension of Reactor Coolant Pump Motor Flywheel Examination."

APPENDIX D: REFERENCES	
Item Number	**Reference**
32	NUREG-0588, "Interim Staff Position on Environmental Qualification of Safety-Related Electrical Equipment."
33	NRC Bulletin No. 88-11, "Pressurizer Surge Line Thermal Stratification," December 20, 1988.
34	XX-E-013, "Post-Fire Safe Shutdown Analysis."
35	Regulatory Guide (RG) 1.89 Revision 1, "Environmental Qualification of Certain Electric Equipment Important to Safety for Nuclear Power Plants."
36	RG 1.188 Revision 1, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses."
37	RG 1.127 Revision 1, "Inspection of Water Control Structures Associated with Nuclear Power Plants."
38	RG 1.190 Revision 0, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."
39	RG 1.99 Revision 2, "Radiation Embrittlement of reactor Vessel Materials."
40	American Society of Mechanical Engineers (ASME) "Boiler and Pressure Vessel Code, Section III, Rules for Construction of Nuclear Power Plant Components" (ASME Code Section III).
41	ASME Code Section XI
42	Auxiliary and Power Conversion Systems Branch (APCSB) 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants," May 1976.
43	Branch Technical Position (BTP) APCSB 9.5-1, Appendix A, August 23, 1976.
44	BTP ASB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment."
45	Interim Staff Guidance (ISG)-5, "Identification and Treatment of Electrical Fuse Holders for License Renewal."
46	"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))," Letter dated April 1, 2002. (ADAMS Accession No. ML020920464)
47	Letter dated April 7, 2003. (ADAMS Accession No. ML030990052)
48	Proposed License Renewal Interim Staff Guidance LR-ISG-2007-02 (ADAMS Accession No. ML0717703761)

NRC FORM 335 (9-2004) NRCMD 3.7

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Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

9. SPONSORING ORGANIZATION - NAME AND ADDRESS *(If NRC, type "Same as above"; if contractor, provide NRC Division, Office or Region, U.S. Nuclear Regulatory Commission, and mailing address.)*

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10. SUPPLEMENTARY NOTES

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11. ABSTRACT *(200 words or less)*

This safety evaluation report (SER) documents the technical review of the Wolf Creek Generating Station (WCGS), Unit 1, license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated September 27, 2006, Wolf Creek Nuclear Operating Corporation (WCNOC or the applicant) submitted the LRA in accordance with Title 10, Part54, of the Code of Federal Regulations, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants." WCNOC requests renewal of the WCGS operating license (Facility Operating License Number NPF-42) for a period of 20 years beyond the current expiration at midnight March 11, 2025.

WCGS is located approximately 3.5 miles northeast of Burlington, Kansas. The NRC issued the construction permit for WCGS on May 31,1977, and operating license on June 4, 1985. WCGS Unit 1 is of a PWR design. Westinghouse Electric Corporation supplied the nuclear steam supply system and Daniel International originally designed and constructed the balance of the plant with the assistance of its agent, Bechtel. The WCGS Unit 1 licensed power output is 3565 megawatt thermal with a gross electrical output of approximately 1228 megawatt electric.

This SER presents the staff's review of information submitted through August 1, 2008, the cutoff date for consideration in the SER, and the final conclusion on the LRA review.

12. KEY WORDS/DESCRIPTORS *(List words or phrases that will assist researchers in locating the report.)*

10 CFR Part 54, license renewal, Wolf Creek Generating Station, scoping and screening, aging management, time-limited aging analysis, safety evaluation report

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