Safety Evaluation Report

With Open Items Related to the License Renewal of James A. FitzPatrick Nuclear Power Plant

Docket No. 50-333

Entergy Nuclear Operations, Inc.

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

July 2007

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ABSTRACT

This safety evaluation report (SER) documents the technical review of the James A. FitzPatrick Nuclear Power Plant (JAFNPP) license renewal application (LRA) by the United States (US) Nuclear Regulatory Commission (NRC) staff (the staff). By letter dated July 31, 2006, Entergy Nuclear Operations, Inc. (ENO or the applicant) submitted the LRA in accordance with Title 10, Part 54, “Requirements for Renewal of Operating Licenses for Nuclear Power Plants,” of the *Code of Federal Regulations*. ENO requests renewal of the JAFNPP operating license (Facility Operating License Number DPR-59) for a period of 20 years beyond the current expiration at midnight October 17, 2014.

JAFNPP is located approximately 7 miles northeast of Oswego, New York. The NRC issued the JAFNPP construction permit on May 20, 1970, and operating license on October 17, 1974. JAFNPP is of a Mark 1, General Electric (GE) 4, boiling water reactor design. GE supplied the nuclear steam supply system and Stone and Webster originally designed and constructed the balance of the plant. The JAFNPP licensed power output is 2536 megawatt thermal with a gross electrical output of approximately 881 megawatt electric.

This SER presents the status of the staff’s review of information submitted through June 20, 2007, the cutoff date for consideration in the SER. Open items and confirmatory items must be resolved before any final determination on the LRA. SER Sections 1.5 and 1.6 summarize open and confirmatory items, respectively. The staff will present its final conclusion on the LRA review in an update to this SER.

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TABLE OF CONTENTS

Appendices

Tables

ABBREVIATIONS

AC	alternating current
ACI	American Concrete Institute
ACRS	Advisory Committee on Reactor Safeguards
ACSR	aluminum conductor steel reinforced
ADAMS	Agencywide Document Access and Management System
ADS	automatic depressurization system
AEM	aging effect/mechanism
AERM	aging effect requiring management
AFW	auxiliary feedwater
AHU	air handling unit
AMC	aging management structural
AME	aging management electrical
AMM	aging management mechanical
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
AOV	air operated valve
APCSB	Auxiliary and Power Conversion Systems Branch
ARI	alternate rod insertion
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
B&W	Babcock and Wilcox
BIP	Bolting Integrity Program
BOP	balance-of-plant
BTP	Branch Technical Position
BWR	boiling water reactor
BWROG	Boiling Water Reactor Owners Group
BWRVIP	Boiling Water Reactor Vessel and Internals Program
CAD	containment air dilution
CASS	cast austenitic stainless steel
CB&I	Chicago Bridge and Iron
CDF	core damage frequency
CEOG	Combustion Engineering Owners Group
CF	chemistry factor
CFR	*Code of Federal Regulations*
CHUG	CHECKWORKS Users Group
CI	confirmatory item
CII	containment inservice inspection
CLB	current licensing basis
CO_2	carbon dioxide
CP	containment purge

CR	condition report
CRD	control rod drive
CRDRL	control rod drive return line
CWS	circulating water system
CS	core spray
CST	condensate storage tank
Cu	copper
CUF	cumulative usage factor
C_VUSE	Charpy upper-shelf energy
DBA	design basis accident
DBD	design basis document
DBE	design basis event
DC	direct current
DHR	decay heat removal
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPY	effective full power years
EMA	equivalent margin analysis
ENN	Entergy Nuclear North
ENO	Entergy Nuclear Operations
EPIC	Emergency Plant Information Computer
EOL	end of life
EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety features
ESW	emergency service water
FAC	flow-accelerated corrosion
F_{en}	environmental fatigue life correction factor
FERC	Federal Energy Regulatory Commission
FF	fluence factor
FMP	Fatigue Monitoring Program
FP	fire protection
FPC	fuel pool cooling
FPCC	fuel pool cooling and cleanup
FR	*Federal Register*
FSAR	final safety analysis report
FSER	final safety evaluation report
ft-lb	foot-pound
FW	feedwater
GALL	Generic Aging Lessons Learned Report
GDC	general design criteria or general design criterion
GE	General Electric
GEIS	Generic Environmental Impact Statement

GL	generic letter
GSI	generic safety issue
HELB	high-energy line break
HPCI	high pressure coolant injection
HPSI	high pressure safety injection
HT	heat transfer
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
I&C	instrumentation and controls
IASCC	irradiation-assisted stress corrosion cracking
ID	inside diameter
IEEE	Institute of Electrical and Electronics Engineers
IGSCC	inter-granular stress corrosion cracking
IN	Information Notice, insulation (electrical)
INPO	Institute of Nuclear Power Operations
IPA	integrated plant assessment
IPE	Individual Plant Examination
IR	insulation resistance
ISG	interim staff guidance
ISI	inservice inspection
ISP	Integrated Surveillance Program
JAFNPP	James A. FitzPatrick Nuclear Power Plant
KV or kV	kilo-volt
LCO	limiting condition for operation
LMS	leakage monitoring system
LOCA	loss of coolant accident
LR	license renewal
LRA	license renewal application
LRBD	license renewal boundary drawings
LRD	license renewal document
LRIS	license renewal information system
LRPD	license renewal project document/report
LRPG	license renewal project guidelines
MEB	metal-enclosed bus
MIC	microbiologically influenced corrosion
MS	main steam
MSIV	main steam isolation valve
MSLCS	main steam leak collection system
N_2	nitrogen
N/A	not applicable
n/cm^2	neutrons per square centimeter

NBVI	nuclear boiling vessel instrumentation
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
Ni	nickel
NMCA	noble metal chemical addition
NPS	nominal pipe size
NRC	US Nuclear Regulatory Commission
NSW	normal service water
NWC	normal water chemistry
NYPA	New York Power Authority
OD	outside diameter
OGH	off-gas holdup
OI	open item
PASNY	Power Authority of the State of New York
PASS	post-accident sampling system
PDI	performance demonstration initiative
PFM	probabilistic fracture mechanics
pH	potential of hydrogen
P&ID	piping and instrumentation diagram/drawing
ppb	parts per billion
ppm	parts per million
PSPM	periodic surveillance and preventive maintenance
P-T	pressure-temperature
PT	penetrant testing
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
QA	quality assurance
RAI	request for additional information
RBCLC	reactor building closed loop cooling
RBCLCW	reactor building closed loop cooling water
RCIC	reactor core isolation cooling
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RHRSW	residual heat removal service water
RO	refueling outage
RPV	reactor pressure vessel
RR	reactor recirculation
RT_{NDT}	reference temperature (nil ductility transition)
RV	reactor vessel
RVID	Reactor Vessel Integrity Database

RWCU	reactor water cleanup
SBO	station blackout
SC	structure and component
SCC	stress-corrosion cracking
SE	Safety Evaluation
SER	Safety Evaluation Report
SGT	standby gas treatment system
SIF	stress intensification factor
SIV	safety injection valve
SO_2	sulfur dioxide
SOV	solenoid valve
SRP	Standard Review Plan
SRP-LR	Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants
SRV	safety/relief valve
SS	sample system, stainless steel
SSC	system, structure, and component
sOI	sub-open item
SW	service water
TAP	torus attached piping
TB	turbine building
TBCLC	turbine building closed loop cooling
TES	Teledyne Engineering Services
TIP	traversing incore probe
TLAA	time-limited aging analysis
TS	technical specification
US	United States
UFSAR	Updated Final Safety Analysis Report
USE	upper-shelf energy
UT	ultrasonic testing
yr	year
Zn	zinc
1/4 T	one-fourth of the way through the vessel wall measured from the internal surface of the vessel

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SECTION 1

INTRODUCTION AND GENERAL DISCUSSION

1.1 Introduction

This document is a safety evaluation report (SER) on the license renewal application (LRA) for James A. FitzPatrick Nuclear Power Plant (JAFNPP) as filed by the Entergy Nuclear Operations, Inc. (ENO or the applicant). By letter dated July 31, 2006, ENO submitted its application to the United States (US) Nuclear Regulatory Commission (NRC) for renewal of the JAFNPP 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 Ngoc B. (Tommy) Le. Mr. Le may be contacted by telephone at 301-415-1458 or by electronic mail at NBL@nrc.gov. Alternatively, written correspondence may be sent to the following address:

License Renewal and Environmental Impacts Program
US Nuclear Regulatory Commission
Washington, DC 20555-0001
Attention: Ngoc B. (Tommy) Le, Mail Stop 011-F1

In its July 31, 2006, submission letter, the applicant requested renewal of the operating license issued under Section 104b (Operating License No. DPR-59) of the Atomic Energy Act of 1954, as amended, for JAFNPP for a period of 20 years beyond the current expiration at midnight October 17, 2014. JAFNPP is located approximately seven miles northeast of Oswego, New York. The NRC issued the JAFNPP construction permit on May 20, 1970, and the operating license on October 17, 1974. JAFNPP is of a Mark 1, GE 4, boiling water reactor design. GE supplied the nuclear steam supply system and Stone and Webster originally designed and constructed the balance of the plant. The JAFNPP licensed power output is 2536 megawatt thermal with a gross electrical output of approximately 881 megawatt electric. The updated final safety analysis report (UFSAR) shows details of the plant and the site.

The license renewal process consists of two concurrent reviews, a technical review of safety issues and an environmental review. The NRC regulations in 10 CFR Part 54, “Requirements For Renewal Of Operating Licenses For Nuclear Power Plant” 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 JAFNPP license renewal is based on (1) the applicant’s LRA and its responses to the staff’s requests for additional information (RAIs) and (2) the staff’s onsite audits of the applicant’s aging management programs and reviews. The applicant supplemented the LRA and provided clarifications through its responses to staff’s RAIs in audits, meetings, and docketed correspondence. Unless otherwise noted, the staff reviewed and considered information submitted through June 20, 2007. The staff reviewed information received after that date depending on the stage of the safety review and the volume and complexity of the information.

The public may view the LRA and all pertinent information and materials, including the UFSAR, at the NRC Public Document Room, on the first floor of One White Flint North, 11555 Rockville Pike, Rockville, MD 20852-2738 (301-415-4737 / 800-397-4209), and at the following public libraries: State University of New York Penfield Library, 7060 State Route 104, Oswego, New York 13126; and Oswego Public Library, 140-142 East Second Street, Oswego, New York 13126. 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 the 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 LRA. 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 for JAFNPP. The staff issued draft plant-specific GEIS Supplement 31, "Generic Environment Impact Statement for License Renewal of Nuclear Plants regarding James A. FitzPatrick Nuclear Power Plant," on June 8, 2007 (ADAMS Accession No. ML071420019). The final plant-specific GEIS Supplement 31, is scheduled to be issued on January 30, 2008.

1.2 License Renewal Background

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

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

In 1991, the staff published 10 CFR Part 54, the License Renewal Rule (Volume 56, page 64943, of the *Federal Register* (56 FR 64943), dated December 13, 1991). The staff participated in an industry-sponsored demonstration program to apply 10 CFR Part 54 to a pilot plant and to gain the experience necessary to develop implementation guidance. To establish a scope of review for license renewal, 10 CFR Part 54 defined age-related degradation unique to license renewal; however, during the demonstration program, the staff found that certain 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 existing plant 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 simpler, more stable, and more predictable than the previous 10 CFR Part 54 process. In particular, as amended, 10 CFR Part 54 focuses on the management of adverse aging effects rather than on 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 periods of extended operation. In addition, the amended 10 CFR Part 54 process clarifies and simplifies the integrated plant assessment for consistency with the revised focus on passive, long-lived structures and components (SCs).

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

1.2.1 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) the failure of which could affect safety-related functions, and (3) are relied on for compliance with the NRC fire protection, environmental qualification (EQ), pressurized thermal shock (PTS), anticipated transient without scram (ATWS), and station blackout (SBO) regulations.

Pursuant to 10 CFR 54.21(a), a license renewal applicant must review all SSCs within the scope of 10 CFR Part 54 to identify SCs subject to an aging management review (AMR). 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. As required by 10 CFR 54.21(a), license renewal applicants must

demonstrate that the aging effects will be managed such that the intended function(s) of those SCs will be maintained consistent with the current licensing basis (CLB) for the period of extended operation. However, active equipment is considered to be adequately monitored and maintained by existing programs. In other words, detrimental aging effects that may affect active equipment can be readily identified and corrected through routine surveillance, performance monitoring, and maintenance. Surveillance and maintenance programs for active equipment, as well as other maintenance aspects of plant design and licensing basis, are required throughout the period of extended operation.

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

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

In 2005, the NRC developed and issued Regulatory Guide (RG) 1.188, "Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses." This RG endorses Nuclear Energy Institute (NEI) 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," issued in June 2005. NEI 95-10 details an acceptable method of implementing 10 CFR Part 54. The staff also used the SRP-LR in reviewing the LRA.

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

1.2.2 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 environmental impacts, the GEIS contains generic findings that apply to all nuclear power plants and are codified in 10 CFR Part 51 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)." Pursuant to 10 CFR 51.53(c)(3)(I), license renewal applicants may incorporate these generic findings in their environmental reports. In

accordance with 10 CFR 51.53(c)(3)(ii), an environmental report also must include analyses of environmental impacts that must be evaluated on a plant-specific basis (i.e., Category 2 issues).

In accordance with the National Environmental Policy Act of 1969 and 10 CFR Part 51, the staff reviewed the plant-specific environmental impacts of license renewal, including whether there was new and significant information not considered in the GEIS. As part of its scoping process, the staff held a public meeting on October 12, 2006, in Oswego, New York, to identify plant-specific environmental issues. Draft plant-specific GEIS Supplement 31 documents the results of the environmental review and makes a preliminary recommendation as to the license renewal action. The staff plans to hold another public meeting for August 1, 2007, in Oswego, New York, to discuss draft, plant-specific GEIS Supplement 31. After considering comments on the draft, the staff published the final plant-specific GEIS Supplement 31 separately from this report.

1.3 Principal Review Matters

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 license renewal applicants 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 LRAs include "conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license." On this issue, the applicant stated in the LRA:

> ... the agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment to the agreement, which is the last to expire. Item 3 of the Attachment to the indemnity agreement, as revised by Amendment No. 10, lists JAFNPP operating license number DPR-59. The applicants request that conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the Attachment to that agreement, specifying the extension of agreement until the expiration date of the renewed JAFNPP facility operating license sought in this application. In addition, should the license number be changed upon issuance of the renewal license, the applicants request that conforming changes be made to Item 3 of the Attachment, and other sections of the indemnity agreement as appropriate.

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

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

Pursuant to 10 CFR 54.21(b), the NRC requires that, each year following submission of the LRA and at least three months before the scheduled completion of the staff's review, the applicant submit an LRA amendment identifying any CLB changes to the facility that affect the contents of the LRA, including the UFSAR supplement. As of the date this SER with open Items was issued, no such LRA amendment had been received from the applicant.

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 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 JAFNPP 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 will issue a report documenting its evaluation of the staff's LRA review and SER. SER Section 5 is reserved for the ACRS report when issued. SER Section 6 documents the findings required by 10 CFR 54.29.

1.4 Interim Staff Guidance

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

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

Table 1.4-1 Current Interim Staff Guidance

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

1.5 Summary of Open Items

As a result of its review of the LRA, including additional information submitted through June 20, 2007, the staff identified the following open items (OIs). An item is considered open if, in the staff's judgement it does not meet all applicable regulatory requirements at the time of the issuance of this SER. The staff has assigned a unique identifying number to each OI.

OI 4.2.1-1: (SER Section 4.2.1 - Reactor Vessel Fluence)

The staff reviewed GE-NE-B1100732-01 report on analysis of the 120 °capsule removed at 13.4 effective full power years (EFPYs) of operation submitted by the applicant to confirm if calculation of fluence values are in accordance with the guidance of RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."

The staff's review of this report found several discrepancies with the RG 1.190 guidance. For determining pressure vessel neutron fluence, the staff finds the projected fluence values unacceptable. The applicant has stated that it will submit a new fluence calculation by a contractor to the staff for review when complete. This item has been identified as **OI 4.2.1-1**.

As noted in OI 4.2.1-1, the applicant's reactor pressure vessel neutron fluence evaluation for the period of extended operation remains an issue to be resolved. This fluence evaluation impacts the staff review of LRA Section 4.2.2 to verify accordance with 10 CFR 54.21(c)(1)(ii) and projection of the analyses to the end of the period of extended operation.

The staff has reviewed the following TLAA sections submitted in the LRA and found the information acceptable pending resolution of OI 4.2.1-1; and thus these items will be identified as sub-OIs (**sOIs**) of OI 4.2.1-1:

<u>sOI 4.2.2-1:</u> (SER Section 4.2.2 - Pressure-Temperature Limits)

The staff finds the applicant's plan to manage the pressure-temperature (P-T) limits acceptable because it will implement changes to the P-T limit curves by the license amendment process (*i.e.*, through revisions of the plant technical specification (TS)) and will meet the requirements of 10 CFR 50.60, 10 CFR Part 50, Appendix G, and the TLAA acceptance guidance of SRP-LR Section 4.2.2.1.3.3.

The staff's review of P-T limits was based on the applicant's fluence values in LRA Section 4.2.1. Until OI 4.2.1-1 is resolved, the staff cannot close its review of this TLAA. This item is **sOI 4.2.2-1.**

<u>sOI 4.2.3-1:</u> (SER Section 4.2.3 - Charpy Upper-Shelf Energy)

The staff determined that the applicant correctly used RG 1.99, Revision 2, Position 1 to calculate the predicted percentage decrease in upper-shelf energy (USE) conservatively for the period of extended operation. The staff also independently calculated (1) the end of life (EOL) USE values for the beltline plate materials at 54 EFPY and (2) the equivalent margin analysis (EMA) of the percent drop in USE for the beltline weld materials through 54 EFPY. Verifying the drop in USE values from neutron irradiation using the RG 1.99, Revision 2 methodology, the staff finds that all the beltline materials meet 10 CFR Part 50, Appendix G, EOL USE or EMA requirements and SRP-LR Section 4.2.3.1.1.2 criteria for USE/EMA TLAAs in accordance with 10 CFR 54.21(c)(1)(ii). SER Table 4.2.3-1 summarizes the results of both the applicant's and the staff's independent USE/EMA calculations for the limiting plate and weld materials.

The staff's review was based on the fluence values provided by the applicant in LRA Section 4.2.1. Until OI 4.2.1-1 is resolved, the staff cannot close its review of this TLAA. This item is **sOI 4.2.3-1.**

<u>sOI 4.2.4-1:</u> (SER Section 4.2.4 - Adjusted Reference Temperature)

The staff confirmed that lower shell axial welds 2-233 A, B, and C fabricated from Heat No. 27204/12008 were the limiting 1/4T reference temperature (nil-ductility transition) (RT_{NDT}) reactor vessel components. The staff calculated a limiting 1/4T RT_{NDT} value of 132.1 °F for this plate material based on the chemistry factor (CF) table for plate/forging materials in RG 1.99, Revision 2 and a 1/4T fluence of 0.174×10^{19} n/cm^2 (E > 1.0 MeV) at 54 EFPY. The 1/4T RT_{NDT} value calculated by the staff at 54 EFPY is within 3.2 °F of that calculated (i.e., 135.3 °F) by the applicant for this material. As the staff's independent 1/4T RT_{NDT} value agreed with that calculated by the applicant, the staff found the applicant's calculated and projected limiting 1/4T RT_{NDT} value for the reactor vessel at 54 EFPY valid and found the TLAA on 1/4T RT_{NDT} values for the reactor vessel through 54 EFPY acceptable in accordance with 10 CFR 54.21(c)(1)(ii).

The staff's review was based on the applicant's fluence values in LRA Section 4.2.1. Until OI 4.2.1-1 is resolved, the staff cannot close its review of this TLAA. This is **sOI 4.2.4-1.**

<u>sOI 4.2.5-1:</u> (SER Section 4.2.5 - Reactor Vessel Circumferential Weld Inspection Relief)

The staff finds the applicant's evaluation for this TLAA acceptable because the 54 EFPY

conditional failure probability for the reactor vessel circumferential welds is bounded by the analysis in the staff SER dated July 28, 1998, and the applicant will use procedures and training to limit cold over-pressure events during the period of extended operation. This analysis satisfies the evaluation requirements of the staff SER dated July 28, 1998; however, the applicant still must request relief from the circumferential weld examination for the period of extended operation in accordance with 10 CFR 50.55a.

The staff's review was based on the applicant's fluence values in LRA Section 4.2.1. Until OI 4.2.1-1 is resolved, the staff cannot close its review of this TLAA. This item is **sOI 4.2.5-1**.

sOI 4.2.6-1: (See SER Section 4.2.6 - Reactor Vessel Axial Weld Failure Probability)

The staff reviewed LRA Section 4.2.6, 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 reviewed the applicant's TLAA of the reactor vessel axial weld failure probability, as summarized in LRA Section 4.2.6, and its response to RAI 4.2.6.1 dated February 12, 2007, supplemented by letter dated June 20, 2007, and determines that the applicant appropriately described how the conditional failure probability for the reactor vessel axial welds is bounded by the analysis in the staff supplemental SER dated March 7, 2000, on the BWRVIP-05 Report for the period of extended operation. The staff therefore finds the applicant's TLAA Section 4.2.6 and UFSAR supplement summary description A.2.2.1.6 acceptable pending resolution of CI 4.2.6-1. The staff concludes that the applicant's TLAA Section 4.2.6 and UFSAR supplement A.2.2.1.6 for the reactor vessel axial weld failure probability comply with the 10 CFR 54.21(c)(1)(ii) TLAA acceptance criterion.

The staff's review was based on the applicant's fluence values in LRA Section 4.2.1. Until OI 4.2.1-1 is resolved, the staff cannot close its review of this TLAA. This item is **sOI 4.2.6-1**.

sOI B.1.24-3: (See SER Section 3.0.3.2.16 - Reactor Vessel Surveillance Program)

On the basis of the staff review for LRA item B.1.24 discussed in SER Section 3.0, the staff finds, pending the resolution of the OIs noted above, that the applicant has demonstrated that the effects of aging due to loss of fracture toughness of the reactor pressure vessel beltline region will be adequately managed, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff has identified this as **sOI B.1.24-3** for OI 4.2.1-1.

OI 4.3.3-1: (SER Section 4.3.3 - Effects of Reactor Water Environment on Fatigue Life)

The staff noted that under Commitment No. 20 the applicant must either (1) redo the 60-year environmentally-adjusted cumulative usage factor (CUF) calculations for the Class 1 locations in LRA Table 4.3-3, including new environmental CUF calculations for the Class 1 portions of the residual heat removal and feedwater piping, (2) manage the aging effects due to fatigue by using an staff-approved AMP to inspect these component locations prior to the period of extended operation, or (3) repair or replace the affected components before exceeding a environmentally-adjusted CUF value of 1.0. If using the first option as the basis for acceptance of the TLAA on environmental fatigue, the applicant will submit the results of the environmentally-adjusted CUF calculations for review and approval at least two years prior to

the period of extended operation.

The staff concludes that the Fatigue Monitoring Program, when supplemented by Commitment No. 20, provides an acceptable basis for managing the impact of the reactor coolant system environment on the Class 1 fatigue calculations, as evaluated in accordance with 10 CFR 54.21(c)(1)(iii), because the applicant either (1) will recalculate new 60-year, environmentally-adjusted CUF values to confirm whether the revised environmentally-adjusted CUFs are less than 1.0 or (2) will manage the effects of fatigue on the components by inspecting for fatigue-induced cracking and with a staff-approved AMP, or (3) will repair or replace the components prior to the period of extended operation.

In LRA Amendment No. 12, June 20, 2007 (ML071770168), the applicant amended the LRA to change the basis for accepting this TLAA in accordance with the criteria of 10 CFR 54.21(c)(1)(iii).

In RAI 4.3.3-1 dated July 25, 2007 (ML072010267), the staff sought further clarifications on the options that could be used under LRA Commitment No. 20 and asked the applicant to identify which option or options under LRA Commitment No. 20 would be used to satisfy the commitment when implemented and, for each option selected to meet the commitment, to provide a sufficient detailed description of the methodology that would be used to satisfy the option. The staff informed the applicant that the information requested in the RAI was necessary in order for the staff to make a determination on the acceptability of the applicant’s TLAA on environmentally-assisted fatigue. The staff therefore requested that the information in the response to RAI 4.3.3-1 be submitted as an amendment to the LRA. The specific details of RAI 4.3.3-1 are provided in ADAMS Accession No. ML072010267.

The staff’s determination on the acceptability of the TLAA on environmentally-assisted fatigue is pending submittal of the applicant’s response to RAI 4.3.3-1 and the staff’s review of the response to this RAI. **This is OI 4.3.3-1.**

1.6 Summary of Confirmatory Items

As a result of its review of the LRA, including additional information submitted through June 20, 2007, the staff identified no confirmatory items. An item is considered confirmatory if the staff and the applicant have reached a satisfactory resolution but the applicant has not yet formally submitted the resolution. The staff has assigned a unique identifying number to each confirmatory item, if any.

There are no confirmatory items in this 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 UFSAR supplement required by 10 CFR 54.21(d) in the next UFSAR update required by 10 CFR 50.71(e) following the issuance of the renewed license.

The second license condition requires future activities described in the UFSAR 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 withdrawal schedule, including spare capsules, must be approved by the staff prior to implementation. All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the staff, as required by 10 CFR Part 50, Appendix H.

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SECTION 2

STRUCTURES AND COMPONENTS SUBJECT TO AGING MANAGEMENT REVIEW

2.1 <u>Scoping and Screening Methodology</u>

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) 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 James A. FitzPatrick Nuclear Power Plant (JAFNPP), within the scope of license renewal and SCs subject to an AMR. The staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) reviewed the Entergy Nuclear Operations, Inc. (ENO or the applicant) scoping and screening methodology to determine whether it meets the scoping requirements of 10 CFR 54.4(a) and the screening requirements of 10 CFR 54.21.

In developing the scoping and screening methodology for the LRA, the applicant considered the requirements of 10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants" (the Rule), statements of consideration on the Rule, and Regulatory Guide (RG) 1.188, which endorses the guidance of Nuclear Energy Institute (NEI) 95-10, Revision 6, "Industry Guideline for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule," dated June 2005. The applicant also considered the correspondence between the staff, other applicants, and the NEI.

2.1.2 Summary of Technical Information in the Application

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

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

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

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

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

2.1.3 Scoping and Screening Program Review

The staff evaluated the LRA scoping and screening methodology in accordance with the guidance in Section 2.1, “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) as to identification of plant SSCs within the scope of the Rule
- 10 CFR 54.4(b) as to identification of the intended functions of plant systems and structures within the scope of the Rule
- 10 CFR 54.21(a)(1) and 10 CFR 54.21(a)(2) as to the methods utilized by the applicant to identify plant SCs subject to an AMR

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

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

The staff conducted a scoping and screening methodology audit at JAFNPP in Oswego, New York during the week of September 26-29, 2006. The audit focused on whether the applicant had developed and implemented adequate guidance for the scoping and screening of SSCs by the methodologies in the LRA and the requirements of the Rule. The staff reviewed implementation of the project level guidelines and topical reports describing the applicant’s scoping and screening methodology. The staff discussed with the applicant details of the implementation and control of the license renewal program and reviewed administrative control documentation and selected design documentation used by the applicant during the scoping and screening process. The staff reviewed the applicant’s processes for quality assurance (QA) for development of the LRA. The staff reviewed the quality attributes of the applicant’s aging management program (AMP) activities described in LRA Appendix A, “Updated Final Safety

Analysis Report Supplement," and LRA Appendix B, "Aging Management Programs and Activities" and the training and qualification of the LRA development team. The staff reviewed scoping and screening results reports for the main steam (MS) system and trenches, valve pits, manholes, and duct banks 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 27, 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, the applicant addressed the following information sources for the license renewal scoping and screening process:

- updated final safety analysis report (UFSAR)
- technical specifications
- safety classification documents
- safety system function sheets
- fire hazards analysis
- safe shutdown analysis
- design-basis documents (DBDs)
- equipment database
- maintenance rule basis documents
- plant layout drawings and license renewal boundary drawings (LRBDs)
- station drawings

The applicant stated that it used this information to specify the functions of plant systems and structures. It then compared these functions to the 10 CFR 54(a)(1)-(3) scoping criteria to determine whether the plant system or structure function is within the scope of license renewal and used these sources to develop the list of structures and components subject to an AMR.

The LRBDs show the systems within the scope of license renewal highlighted in color.

2.1.3.1.2 Staff Evaluation

<u>Scoping and Screening Implementation Procedures</u>. As documented in the audit report, the staff reviewed the applicant's scoping and screening methodology implementation procedures, including license renewal project guidelines (LRPGs), license renewal project documents/reports (LRPDs), AMR reports (specifically AMMs - mechanical, AMEs - electrical, and AMCs - structural), for consistency with the requirements of the Rule, the Standard Review

Plan for License Renewal (SRP-LR), and NEI 95-10.

The staff found the overall process for implementing 10 CFR Part 54 requirements included in the LRPGs, LRPDs and AMRs consistent with the Rule and industry guidance. The staff found guidance for identifying plant SSCs within the scope of the Rule, including guidelines for identifying SC component types within the scope of license renewal subject to an AMR, in the LRPGs, LRPDs and AMRs. The review of these procedures focused on the consistency of the detailed procedural guidance with information in the LRA reflecting implementation of staff positions in the SRP-LR, interim staff guidance documents, and the information in request for additional information (RAI) responses dated November 22, 2006.

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

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

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

During the audit, the staff reviewed the applicant’s information sources and samples of such information, including the UFSAR, DBDs, controlled plant reference drawings, LRBDs, and Maintenance Rule information.

In addition, the applicant’s license renewal process indicated additional potential sources of plant information pertinent to the scoping and screening process, including licensing correspondence, a fire hazards analysis, safety evaluations, and design documentation (*e.g.*, engineering calculations and design specifications). The staff verified that the applicant’s detailed LRPGs required use of the CLB source information in developing scoping evaluations.

The component database is the applicant’s primary repository for component safety classification information. During the audit, the staff reviewed the applicant’s administrative controls for component database safety classification data. Plant administrative procedures describe these controls and govern their implementation.

Based on a review of the administrative controls and a sample of the component database

component safety classifications, the staff concluded that the applicant's measures to control the integrity and reliability of component database safety classification data are adequate, and, therefore, that the component database is a source of component data sufficiently controlled to support scoping and screening evaluations.

During the staff's review of the applicant's CLB evaluation process, the applicant discussed with the staff the incorporation of CLB updates and the process for adequate incorporation into the license renewal process. The staff determined that the LRA Section 2.1 description of the CLB and related documents of the scoping and screening process is consistent with SRP-LR guidance. In addition, the staff reviewed technical reports supporting reliance on SSCs to demonstrate compliance with safety-related criteria, nonsafety-related criteria, and regulation of the five events specified in 10 CFR 54.4(a)(1)-(3). The applicant's LRPGs comprehensively listed documents supporting scoping and screening evaluations. The staff found these design documentation sources useful in reviewing the applicant's initial scope of SSCs for consistency with the CLB.

2.1.3.1.3 Conclusion

Based on its review of LRA Section 2.1, the detailed scoping and screening implementation procedures, and the results from the scoping and screening audit, the staff concludes that the applicant's scoping and screening methodology considers CLB information consistently with SRP-LR and RG 1.188; 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 applicant's quality controls for adequate implementation of scoping and screening methodologies in the LRA. Although it did not develop the LRA under a 10 CFR Part 50, Appendix B, QA program, the applicant used the following QA processes during the LRA development:

- The applicant developed License Renewal Project Plan JAF-RPT-05-LRP01 as the QA guide implemented for LRA preparation.
- Written procedures governed implementation of the scoping and screening methodology. A tracking system accounted for dates when procedures were originally issued and subsequently revised.
- The applicant reviewed previous RAIs for whether the LRA addressed pertinent issues.
- The Offsite and Onsite Safety Review Committees reviewed the LRA prior to its submission to the staff.
- The QA committee examined the license renewal procedures and documents for whether the LRA was in accordance with 10 CFR 54.4.

2.1.3.2.2 Conclusion

Based on its review of pertinent LRA development guidance, discussion with the applicant's

license renewal personnel, and information from the staff's review of the JAFNPP's quality audit reports, the staff concludes that these QA activities meet current regulatory requirements and add assurance that LRA development activities have been according to 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 license renewal scoping and screening activities and LRA development were accomplished by Entergy, Areva, and JAFNPP personnel trained under the License Renewal Project Plan, which included training requirements for both corporate and onsite personnel and indicated the level of training appropriate to each license renewal task.

Corporate level training of Entergy and Areva personnel required comprehension of license renewal procedures, guidelines, formats, industrial documents, scoping, screening, and industry guidance and regulations required for scoping and screening activities and LRA development. As a training record the applicant developed a training check list of procedures and documents studied and levels of knowledge expected from class attendance. Onsite level training ensured a general understanding of the license renewal process and terminology so JAFNPP license renewal personnel could evaluate license renewal documents for technical accuracy.

The staff reviewed completed qualification and training records of several of the applicant's license renewal personnel and also reviewed completed check lists. The staff determined that these records adequately document the required training for applicant personnel. Additionally, after discussions with the applicant's license renewal personnel during the audit, the staff verified that the applicant's personnel were knowledgeable about the license renewal process requirements and specific technical issues within their areas of responsibility.

2.1.3.3.2 Conclusion

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

2.1.3.4 Conclusion of Scoping and Screening Program Review

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

2.1.4 Plant Systems, Structures, and Components Scoping Methodology

LRA Section 2.1.1 describes the methodology for scoping SSCs pursuant to 10 CFR 54.4(a) and the plant scoping process for systems and structures.

Specifically, the scoping process developed a list of plant systems and structures with intended functions as the bases for their inclusion within the scope of license renewal (as defined in 10 CFR 54.4(b)) by comparison of the system or structure functions with 10 CFR 54.4(a) criteria. The systems list was developed from the component database and the structures list from the UFSAR, Maintenance Rule documentation, plant layout drawings, and structure-specific system codes in the component database. As described by the applicant, for mechanical system scoping, a system is defined as the collection of components in the equipment database assigned to the system code. System functions are based on component functions.

Finally, the applicant evaluated the components in the systems and structures within the scope of license renewal. The LRBDs depicted the in-scope system boundary of SCs subject to AMRs. The following sections address the applicant's scoping methodology as described in the LRA.

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 2.1.1.1 describes the 10 CFR Part 54 scoping methodology as to 10 CFR 54.4(a)(1) safety-related criteria, stating that systems and structures with safety functions as defined by 10 CFR 54.4(a)(1) are within the scope of license renewal. Intended functions for mechanical systems and structures were based on applicable plant licensing and design documents including the UFSAR, technical specifications, safety system function sheets, the fire hazards analysis, the safe shutdown analysis, DBDs, Maintenance Rule basis documents, and various station drawings as required. The applicant also confirmed that all plant conditions of normal operation, abnormal operational transients, design-basis accidents, internal and external events, and natural phenomena for which the plant must be designed had been considered for license renewal scoping under 10 CFR 54.4(a)(1)(i) through (iii) criteria. Corporate and site procedures control the component and structure quality classifications.

Further, the applicant's definition of an SSC as safety-related is the same in 10 CFR 54.4 with the exception of the guidelines for offsite exposures. Section 54.4 of 10 CFR refers to 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), and 10 CFR 100.11 dose guidelines. The exposure guidelines of 10 CFR 50.34(a)(1) do not apply because the construction permit was issued before January 10, 1997. The exposure guidelines of 10 CFR 50.67(b)(2) address the alternate source term, which the applicant has credited in the refueling accident analysis. The applicant reviewed the systems and components credited in this limited use of 10 CFR 50.67 for inclusion 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 (a) the integrity of the reactor coolant pressure boundary, (b) the ability to shut down the reactor and maintain it in a safe shutdown condition, or (c) the ability to prevent or mitigate the consequences of accidents that could cause offsite exposures comparable to those of 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11.

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

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

The applicant scoped SSCs for the 10 CFR 54.4(a)(1) criterion with the LRPGs, piping and instrumentation diagrams (P&IDs), and other information sources as guidance in the preparation, review, verification, and approval of the scoping evaluations for adequate scoping results.

The staff reviewed these guidance documents for the applicant’s evaluation of safety-related SSCs, and sampled the applicant’s scoping reports for methodology implemented in accordance with those written instructions. In addition, the staff discussed the methodology and results with the applicant's personnel responsible for these evaluations. Specifically, the staff reviewed a sample of the license renewal scoping results for the MS and high-pressure coolant injection (HPCI) systems and for the structural components (*e.g.*, trenches, valve pits, manhole, and duct bank structures) for additional assurance that the applicant had implemented its scoping methodology adequately as to 10 CFR 54.4(a)(1). The staff verified that the scoping results for each of the sampled systems were consistent with the methodology, that the SSCs performing intended functions were credited, and that the bases for the results and intended functions were described adequately. The staff verified that the applicant had used pertinent engineering and licensing information to credit SSCs required to be within the scope of license renewal in accordance with 10 CFR 54.4(a)(1) criteria.

To facilitate the identification of SSCs within the scope of license renewal according to 10 CFR 54.4(a) criteria, the applicant developed a license renewal information system (LRIS) with detailed design description information about all plant systems and structures and their relevant functions and developed a list of safety-related SCs initially using the list in the component database. The applicant used component database safety-classification fields to consider systems or structures with safety-related components for inclusion within the scope of the license renewal. SC1 component safety classification fields corresponded to

10 CFR 54.4(a) criteria and the SC1 database safety-classification and related plant system drawings were the applicant's starting points for specific components required to meet the 10 CFR 54.4(a)(1) criterion.

During the audit, the applicant described the process for evaluating components classified as safety-related with no safety-related intended function. As part of the process, the applicant stated, safety classifications of several components were re-evaluated to reconcile differences between scoping determinations and facility database or CLB information. The applicant evaluated safety-related components not performing intended functions and described explicitly in the LRPDs the rationale for their exclusion from the scope of license renewal. The applicant further evaluated the component database for components classified as safety-related but performing no safety-related functions for verification that the CLB does not credit them for such functions. Such verifications are documented in the scoping evaluations in the license renewal results document.

The staff reviewed the safety classification criteria for consistency between the CLB and the Rule definitions and the applicant's evaluation of the differences between the Rule definition and the site-specific definition of "safety-related" for whether the applicant addressed adequately all SSCs potentially meeting 10 CFR 54.4(a)(1) requirements. The applicant documented this evaluation in the LRA and LRPGs. As part of license renewal development, the applicant stated, the site-specific definition of "safety-related" was nearly identical to the Rule definition with the following exception:

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

During the audit, the staff reviewed the applicant's evaluation of the Rule and CLB definitions as to 10 CFR 54.4(a)(1). Based on this review, the staff verified that 10 CFR 50.34(a)(1) does not apply because it covers construction permit applications since January 10, 1997. In addition, the applicant has amended its operating license to allow use of an alternative source term for fuel handling accident analysis in accordance with 10 CFR 50.67. The change to 10 CFR 50.67 dose limits does not affect the applicant's safety classification definition; however, the applicant included all SSCs within the scope of license renewal as a result of its use of the alternative source term. The staff reviewed the applicant's evaluation and discussed it with the applicant's license renewal team. The staff determined that the applicant adequately evaluated the differences between the applicant's definition and the Rule definition of "safety-related" and that these differences did not cause any components to be considered safety-related beyond those in the CLB.

2.1.4.1.3 Conclusion

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

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

2.1.4.2.1 Summary of Technical Information in the Application

LRA Section 2.1.1.2 describes the scoping methodology as to 10 CFR 54.4(a)(2) nonsafety-related criteria. The applicant's 10 CFR 54.4(a)(2) scoping methodology was based on guidance from RG 1.188. The applicant's evaluation of the impacts of nonsafety-related SSCs that met 10 CFR 54.4(a)(2) criteria used two major categories: (1) functional failure and (2) physical failure. Summary descriptions of these two categories follow:

Functional Failure of Nonsafety-Related SSCs. SSCs required to perform functions in support of safety-related components were classified as safety-related and within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The applicant reviewed engineering and licensing documents (UFSAR, Maintenance Rule scoping documents, and DBDs) for exceptions included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). For the few exceptions of nonsafety-related components that must support safety functions, LRA Section 2.3 describes the system intended functions and includes the components in the appropriate AMRs.

Physical Failures of Nonsafety-Related SSCs. The applicant evaluated the impact of physical failures of nonsafety-related SSCs within the scope of license renewal in accordance with 10 CFR 54.4(a)(2) under the following two categories:

(1) *Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs*. The applicant evaluated certain nonsafety-related components and piping outside the safety class pressure boundary required to be structurally sound to maintain the pressure boundary integrity of safety-related piping. These components perform a structural support function. For piping in this structural boundary, pressure integrity is not required (except for spatial interaction between nonsafety-related and safety-related SSCs); however, piping within the safety class pressure boundary depends on the structural boundary piping and supports for the system to fulfill its safety function.

For JAFNPP, the "structural boundary" is defined as the portion of a piping system outside the safety class pressure boundary yet relied upon for its structural support.

(2) *Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs*. The applicant considered various modes of spatial interactions when evaluating potential spatial interaction between nonsafety-related systems and safety-related SSCs and addressed them in the following categories:

physical impact (*e.g.*, seismic Class II/I) or flooding
pipe whip, jet impingement, or harsh environment from piping rupture
damage due to leakage or spray from nonsafety-related SSCs.

As documented in the audit report, the results of the applicant's evaluation of nonsafety-related SSCs affecting safety-related SSCs were incorporated into the license renewal project report, which describes for 10 CFR 54.4(a)(2) review the AMR of nonsafety-related systems and components affecting safety-related systems. These results, described in LRA Sections 2.1.1.2

and 2.3.3.14, were input to the scoping and screening process.

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

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 license renewal applications. NEI 95-10, Revision 6, addresses the staff positions on 10 CFR 54.4(a)(2) scoping criteria, nonsafety-related SSCs typically identified in the CLB, consideration of missiles, cranes, flooding, high-energy line breaks, nonsafety-related SSCs connected to safety-related SSCs, nonsafety-related SSCs in proximity of safety-related SSCs, and the mitigative and preventive options in nonsafety-related and safety-related SSCs interactions.

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

The staff reviewed LRA Sections 2.1.1.2 and 2.3.3.14, where the applicant described the scoping methodology for nonsafety-related criteria in accordance with 10 CFR 54.4(a)(2). In addition, the staff reviewed the 10 CFR 54.4(a)(2) license renewal project report prepared by the applicant as described in Safety Evaluation Report (SER) Section 2.1.4.2.1. The applicant’s evaluations were in accordance with the guidance of NEI 95-10, Revision 6, on the treatment of SSCs meeting 10 CFR 54.4(a)(2) criteria. SER Section 2.1.4.2.1 also describes the applicant’s evaluation of nonsafety-related SSCs meeting 10 CFR 54.4(a)(2) criteria based on “functional failure” and “physical failure” categories.

Based on a review of the LRA information and the aging management report for 10 CFR 54.4(a)(2) criteria and discussions with the applicant during the audit, the staff’s evaluation as to the applicant’s categories follows in detail.

The applicant evaluated 10 CFR 54.4(a)(2) SSCs with the four 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 nonsafety-related SSCs required to perform functions in support of safety-related functions were classified as safety-related in the applicant’s equipment database and

included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The applicant's 10 CFR 54.4(a)(2) aging management report addresses this criterion. For exceptions to this approach where nonsafety-related components are required to support safety functions, the appropriate AMR included the equipment. Exceptions are containment equipment drains, vacuum priming and air removal, and the offgas portion of gas handling (all three support standby gas treatment (SGT)); fuel pool cooling and cleanup (support secondary means of pool makeup); residual heat removal (RHR) (nonsafety-related portions support fuel pool cooling); condensate storage (supports emergency core cooling system (ECCS)); and MS leak collection system. These systems classified as nonsafety-related are required to perform a functions to support safety-related functions and were included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The staff found that the applicant had implemented an acceptable method for scoping of nonsafety-related systems performing functions that support safety-related intended functions.

(2) Nonsafety-Related Systems Connected to and Structurally Supporting Safety-Related SSCs - To identify the nonsafety-related SSCs directly connected to and required to be structurally sound to maintain the integrity of safety-related SSCs, the applicant has used a bounding approach (described in NEI 95-10, Appendix F), a seismic analysis, and engineering judgment. The applicant reviewed each mechanical system safety-related to nonsafety-related interface for components located between the interface and the structural boundary or equivalent anchor (if used). The applicant included all nonsafety-related SSCs within the scope of license renewal and within the analyzed structural boundary in accordance with 10 CFR 54.4(a)(2). For structural boundaries not indicated on drawings, the applicant included within the scope of license renewal portions of the nonsafety-related SSCs beyond the safety-related SSCs to the first equivalent anchor or seismic anchor. The LRA also indicates that if the structural boundary for the interface of nonsafety-related and safety-related could not be determined the nonsafety-related SSCs were included to a point beyond the interface to a base-mounted component, flexible connection, or the end of the piping run in accordance with NEI 95-10, Appendix F, guidance describing the use of "bounding criteria" for determining the portion of nonsafety-related SSCs to be included within the scope of license renewal. This method assured inclusion of the nonsafety-related piping systems in the design-basis seismic analysis within the scope of license renewal. The applicant's license renewal 10 CFR 54.4(a)(2) aging management report depicts these nonsafety-related systems and components at nonsafety-related/safety-related boundaries. This report also lists the AMR results of the component types with the corresponding intended functions, materials, environments, aging effects, and programs.

As to the use of equivalent anchors, staff discussions with the applicant's project team during the audit revealed that equivalent anchors, flexible connections, and buried piping were not used. Additionally, LRA Section 2.1.2.1.2 and the license renewal 10 CFR 54.4(a)(2) aging management report further confirm that its evaluation of each mechanical system for safety-related to nonsafety-related interfaces and the first structural boundary including seismic anchors, the bounding approach, was based on the guidance of NEI 95-10, Appendix F.

(3) Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs - As reported in SER Section 2.1.4.2.1, the applicant considered physical impact or flooding; pipe whip, jet impingement, or harsh environments; and fluid leakage or spray when evaluating the potential for spatial interactions between nonsafety-related systems and safety-related SSCs. The applicant used a spaces approach for scoping of nonsafety-related systems with potential spatial interaction with safety-related SSCs focused on the interaction between nonsafety-related and safety-related SSCs located in the same space. A "space" was defined as a room or cubicle separated from other spaces by substantial objects (*e.g.*, walls, floors, and ceilings). The space was defined to limit any potential interaction between nonsafety-related and safety-related SSCs to the space.

As related to *physical impact or flooding*, and as described in the LRA, the applicant considered situations where nonsafety-related supports for nonseismic (including seismic II/I) piping systems and electrical conduit and cable trays with potential for spatial interaction with safety-related SSCs are included within the scope of license renewal per 10 CFR 54.4(a)(2) and subject to an AMR. Civil/structural aging management reports address these supports and components as commodities. In the applicant's earthquake experience there are no occurrences of welded steel pipe segments falling. The applicant concluded that, as long as the effects of aging on piping system supports are managed, falling of piping systems is not plausible except if due to flow-accelerated corrosion and the piping section itself is not within the scope for 10 CFR 54.4(a)(2) due to a physical impact hazard. The applicant evaluated missiles that could be generated from internal or external events like failure of rotating equipment. The nonsafety-related design features which protect safety-related SSCs from such missiles are within the scope of license renewal.

In addition, the applicant evaluated overhead-handling systems for structural failure that could cause damage to any system and prevent the accomplishment of a safety function. Nonsafety-related overhead-handling equipment determined to have a possible impact on safety-related SSCs was included within the scope of license renewal.

As to *pipe whip, jet impingement, and harsh environment*, the applicant evaluated nonsafety-related portions of high-energy lines against 10 CFR 54.4(a)(2) criteria. The applicant's evaluation was based on a review of the UFSAR and relevant site documentation. The applicant's high-energy systems were evaluated for component parts of safety-related high-energy lines that can affect safety-related equipment.

If the applicant's high-energy line break analysis assumed that a nonsafety-related piping system would not fail or assumed failure only at specific locations, that piping system (*i.e.*, piping, equipment and supports) was included within the scope of license renewal per 10 CFR 54.4(a)(2) criteria and subject to an AMR for reasonable assurance that those assumptions remain valid through the period of extended operation. Also, as addressed in the LRPD for 10 CFR 54.4(a)(2) review, the applicant studied the reference documents with high-energy line break analysis for inside as well as outside containment and indicated high-energy lines for the MS, HPCI, reactor core isolation cooling (RCIC), core spray (CS), and reactor water clean-up systems. Many of these systems were safety-related and included within the scope of license renewal in accordance with 10 CFR 54.4(a)(1). The remaining nonsafety-related high-energy lines with potential interaction with safety-related SSCs were

included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2).

For *spray or leakage* effects, the applicant evaluated moderate- and low-energy systems with the potential for spatial interactions of spray and leakage. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for spray or leakage that could prevent safety-related SSCs from performing required safety functions were considered within the scope of license renewal. The applicant used a “spaces” approach for nonsafety-related SSCs located within the same space as safety-related SSCs. As described in the LRA, a space is a room or cubicle separated from other spaces by substantial objects (*e.g.*, walls, floors, and ceilings). The space was defined to limit any potential interaction between nonsafety-related and safety-related SSCs to the space. The applicant documented in its scoping results (license renewal document (LRD)) report the evaluation of each mechanical system for potential spatial interaction with safety-related SSCs as documented in the staff audit report. After documenting the mechanical systems, the applicant evaluated system functions for whether the system contained fluid, air, or gas. Based on spray or leakage and operating experience, the applicant excluded nonsafety-related SSCs containing air or gas from the scope of license renewal. The applicant then evaluated the mechanical systems for components located within safety-related structures. Those liquid-filled systems with components located within safety-related structures then were evaluated for components located within spaces containing safety-related SSCs. Nonsafety-related SSCs containing fluid and located within spaces containing safety-related SSCs, were included within the scope of license renewal.

Protective features (*e.g.*, whip restraints, spray shields, supports, missile or flood barriers) preventing physical impact and fluid leakage, spray, or flooding are installed to protect safety-related SSCs against spatial interaction with nonsafety-related SSCs. Such protective features credited in the plant design were included within the scope of license renewal and are subject to An AMR.

2.1.4.2.3 Conclusion

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

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

2.1.4.3.1 Summary of Technical Information in the Application

LRA Section 2.1.1.3 describes the methodology for identifying SSCs within the scope of license renewal. Mechanical systems and structures that perform fire protection (FP), anticipated transient without scram (ATWS), or station blackout (SBO) intended functions were included within the scope of license renewal. LRA Sections 2.3 and 2.4 indicate mechanical systems and structures with 10 CFR 54.4(a)(3) intended functions. For example, LRA Section 2.3.2.2 states that the CS system has a 10 CFR 54.4(a)(3) intended function. The CS system is credited in the 10 CFR Part 50 Appendix R safe shutdown capability analysis (10 CFR 50.48). LRA Section 2.4.3 states that the radioactive waste building has one 10 CFR 54.4(a)(3) intended

function. The radioactive waste building houses equipment credited for FP (10 CFR 50.48). All electrical and instrumentation and control (I&C) systems and electrical equipment in mechanical systems were included within the scope of license renewal.

Fire Protection. LRA Section 2.1.1.3.1, "Commission's Regulations for Fire Protection (10 CFR 50.48)," describes the scoping of mechanical systems and structures required to demonstrate compliance with the FP requirements in. From its CLB the applicant indicated the mechanical systems and structures relied upon to meet 10 CFR Part 50 Appendix R and 10 CFR 50.48 requirements. Mechanical systems and structures credited with FP and fire detection and mitigation in areas with safety-related equipment and equipment credited with safe shutdown in a fire were included within the scope of license renewal.

Environmental Qualification (EQ). LRA Section 2.1.1.3.2, "Commission's Regulations for Environmental Qualification (10 CFR 50.49)," describes the 10 CFR 50.49 EQ requirements. All electrical and I&C systems and electrical equipment in mechanical systems were included within the scope of license renewal. Consequently, environmentally-qualified equipment was included within the scope of license renewal.

Pressurized Thermal Shock. These requirements do not apply to JAFNPP, a boiling-water reactor.

Anticipated Transient Without Scram. LRA Section 2.1.1.3.4, "Commission's Regulations for Anticipated Transients Without Scram (10 CFR 50.62)," describes the scoping of mechanical systems and structures required to demonstrate compliance with 10 CFR 50.62 ATWS requirements. Mechanical systems and structures that perform 10 CFR 50.62 intended functions were included within the scope of license renewal.

Station Blackout. LRA Section 2.1.1.3.5, "Commission's Regulations for Station Blackout (10 CFR 50.63)," describes the scoping criteria. The applicant developed a four-hour coping analysis to address 10 CFR 50.63 requirements. Based on the its CLB for SBO, the applicant determined system intended functions in support of 10 CFR 50.63 requirements. Based on staff guidance in SRP-LR Section 2.5.2.1.1, the applicant conservatively included certain switchyard components required to restore offsite power within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations for functions that demonstrates compliance with SBO regulations (10 CFR 50.63). The applicant uses a bounding approach to scoping for electrical equipment. Onsite electrical systems and electrical equipment in mechanical systems are included by default within the scope of license renewal. Consequently, electrical equipment supporting 10 CFR 50.63 requirements was included within the scope of license renewal.

2.1.4.3.2 Staff Evaluation

The staff reviewed the applicant's approach to indicating mechanical systems and structures relied upon to perform functions related to the four regulated BWR events as described in 10 CFR 54.4(a)(3). As part of this review, the staff discussed the methodology with the applicant, reviewed the documentation developed to support the approach, and evaluated a sample of the mechanical systems and structures indicated as within the scope of 10 CFR 54.4(a)(3) criteria.

The applicant's implementing procedures describe the process for indicating systems and structures within the scope of license renewal, stating that all mechanical systems and structures performing intended functions for 10 CFR 54.4(a)(3) were included within the scope of license renewal and that the scoping results are in the applicants scoping results report, which also describes the information sources, including the UFSAR, the system safety function sheets, and the system design basis documents, for mechanical systems and structures credited for response to regulated events.

Fire Protection. The LRD states that the applicant used the Fire Hazard Analysis, Fire Protection, and Appendix R Program; the Safe Shutdown Capability Reassessment; and the Technical Requirements Manual to indicate mechanical systems and structures included within the scope of license renewal for FP. The LRD shows the mechanical systems included within the scope of license renewal because they perform 10 CFR 50.48 intended functions, summarizes scoping results for mechanical systems, and identifies 26 mechanical systems with one or more 10 CFR 50.48 intended functions. The report also indicates structures within the scope of license renewal because they perform 10 CFR 50.48 functions and summarizes scoping results for ten structures with one or more 10 CFR 50.48 intended functions. A summary of the scoping results for structures indicates 14 with one or more 10 CFR 50.48 intended functions. The staff reviewed the Fire Hazard Analysis, Fire Protection, and Appendix R Program; the Safe Shutdown Capability Reassessment; the Technical Requirements Manual; and the results reports to verify the SSCs to be included within the scope of license renewal for FP and determined that the methodology had been appropriate.

Environmental Qualification. Using a bounding scoping approach for electrical equipment, the applicant included by default all electrical systems and all electrical equipment in mechanical systems, including equipment relied upon to perform functions that demonstrate compliance with EQ regulations, within the scope of license renewal.

As documented in the audit report, for the EQ-regulated event, after reviewing the LRA and the applicant's implementation procedures, results reports, and the master equipment list for EQ components to verify that the applicant had indicated SSCs included within the scope of license renewal for EQ, the staff determined that the methodology had been applied appropriately.

Anticipated Transient Without Scram. The applicant's scoping results report indicates the mechanical systems included within the scope of license renewal because they perform 10 CFR 50.62 intended functions. For example, the control rod drive (CRD) system has one intended function, alternate rod insertion during an ATWS. The report summarizes the scoping results for mechanical systems, indicates that the CRD and standby liquid control (SLC) systems perform 10 CFR 50.62 intended functions, and includes one structure within the scope of license renewal because it performs a 10 CFR 50.62 intended function. The reactor building was included within the scope of licensee renewal because it houses equipment credited for ATWS.

Station Blackout. The applicant's scoping results report states that mechanical systems and structures credited with the four-hour coping duration were included within the scope of license renewal. The applicant conservatively included within the scope of license renewal switchyard components required to restore offsite power even though those components are not relied on in safety analyses or plant evaluations to perform functions demonstrating compliance with

SBO regulation (10 CFR 50.63). The report identified mechanical systems included within the scope of license renewal because they perform 10 CFR 50.63 intended functions. For example, the RCIC system has an intended function to provide makeup water to the reactor vessel during SBO. The report summarizes the scoping results for mechanical systems and indicates four with one or more 10 CFR 50.62 intended functions. The report also indicates structures included within the scope of license renewal because they perform 10 CFR 50.62 functions. For example, the transformer/switchyard support structures have an intended function to support equipment credited for SBO. The report summarizes the scoping results for structures and indicates five structures with one or more 10 CFR 50.62 intended functions.

2.1.4.3.3 Conclusion

Based on the sample review, discussions with the applicant, and review of the applicant's scoping process, the staff determines that the applicant's methodology for identifying systems and structures is consistent with Interim Staff Guidance 2 (ISG-2) for meeting the requirements of the SBO Rule (10 CFR 50.63) and thus has met 10 CFR 54.4(a)(3) scoping criteria and is, therefore, acceptable.

2.1.4.4 Plant-Level Scoping of Systems and Structures

2.1.4.4.1 Summary of Technical Information in the Application

System and Structure Level Scoping. As documented in the audit report, the applicant documented its methodology for scoping SSCs in accordance with 10 CFR 54.4(a) in the LRPGs, project documents, and aging management report. The applicant's approach to system and structure scoping stated in the site guidance was consistent with the methodology described in LRA Section 2.1. Particularly, the LRPG specifies that license renewal scoping personnel use CLB documents to describe the system or structure including a list of functions it is required to perform. Sources of information on the CLB for systems include the USAR, DBDs, the component database, Maintenance Rule scoping reports, control drawings, and docketed correspondence. The applicant then determined whether the system or structure functions met 10 CFR 54.4(a) scoping criteria. The applicant documented the results of the plant-level scoping process in accordance with the LRPGs. The systems and structures scoping report contained in the LRDs provided these results. Information in the results report includes a structure or system description, the functions it performs, system realignment (as applicable), intended functions, the 10 CFR 54.4(a) scoping criteria met, references, and the bases for the classification of the system or structure intended functions. During the scoping methodology audit, the staff reviewed a sampling of LRD reports and concluded that the applicant reported scoping results in an appropriate level of detail to document the scoping process.

Based on a review of the LRA, the scoping and screening implementation procedures, and a sampling review of system and structure scoping results during the methodology audit, the staff finds the applicant's scoping methodology for systems and structures meeting the requirements of 10 CFR 54. In particular, the staff determines that the applicant's methodology reasonably indicates systems and structures within the scope of license renewal and their intended functions.

Component Level Scoping. After indicating the systems and structures within the scope of

license renewal, the applicant reviewed mechanical systems and structures for components in each system and structure within the scope of license renewal. The structural and mechanical components that supported intended functions were considered within the scope of license renewal and screened to determine whether an AMR was required. All electrical components within the scope of mechanical and electrical systems were included within the scope of license renewal as commodity groups. The applicant considered three component classifications during this stage of the scoping methodology: mechanical, structural, and electrical. The component database and controlled plant drawings comprehensively listed plant components. The applicant used component type and unique component identification numbers for each component within the scope of license renewal and subject to an AMR.

Commodity Groups Scoping. Initially the applicant included all electrical components within the scope of mechanical and electrical systems as separated commodity groups. The applicant screened out many electrical component types considered active according to RG 1.188 and the SRP-LR as not meeting the passive criteria and not subject to an AMR. LRA Section 2.1.2.3 describes the commodity groups for evaluating all in-scope electrical components subject to An AMR.

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

- steel
- threaded fasteners
- concrete
- fire barriers

Insulation. LRA Section 2.4.4, “Bulk Commodities,” states that insulation may have the specific intended functions of (1) controlling heat load during design-basis accidents (DBAs) in areas with safety-related equipment or (2) maintaining integrity so falling insulation does not damage safety-related equipment (reflective metallic-type reactor vessel insulation). As such insulation is included within the scope of license renewal as a commodity group in applications where it performs either intended function.

Consumables. LRA Section 2.1.2.4, “Consumables,” addresses short-lived items. The applicant used the guidance in SRP-LR Table 2.1-3 to evaluate consumables, dividing them into the following four categories for purposes of license renewal: (a) packing, gaskets, component seals, and O-rings, (b) structural sealants, (c) oil, grease, and filters, and (d) system filters, fire extinguishers, fire hoses, and air packs.

Group (a) subcomponents are not relied upon to form a pressure-retaining function and, therefore, not subject to an AMR. Group (b) subcomponents are structural sealants for structures within the scope of license renewal that require an AMR. Group (c) subcomponents are periodically replaced and monitored for condition according to plant procedures and, therefore, not subject to an AMR. Group (d) consumables are subject to replacement based on National Fire Protection Association (NFPA) standards according to plant procedures and, therefore, not subject to an AMR.

2.1.4.4.2 Staff Evaluation

The staff reviewed the applicant's methodology for scoping plant systems and components for consistency with 10 CFR 54.4(a). The applicant documented the methodology for identifying mechanical SSCs within the scope of license renewal in the license renewal results report and plant level scoping results in LRA Tables 2.2-1a for mechanical systems and 2.2-3 for structures. The scoping process defined the entire plant in terms of systems and structures. Specifically, the applicant used the LRPGs to indicate the systems and structures subject to 10 CFR 54.4 review, to describe the processes for recording the results of the review, and to determine whether the system or structure performed intended functions consistent with 10 CFR 54.4(a) criteria. The process was completed for all systems and structures to address the entire plant. The applicant's personnel initially reviewed systems and structures in the CLB.

The staff noted that a system or structure was presumed to be within the scope of license renewal if it performed one or more safety-related functions or met other scoping criteria per the Rule as determined by CLB review. Mechanical and structural component types that support intended functions and all component types in electrical systems were considered within the scope of license renewal and placed in commodity groups. The applicant screened electrical commodity groups further to determine whether they required An AMR. The staff found no discrepancies with the applicant's methodology.

The staff reviewed the applicant's methodology for generating commodity groups. The LRDs indicate separate commodity groups for various mechanical, structural, and electrical components. The staff reviewed the commodity group level functions evaluated by the applicant in accordance with 10 CFR 54.4(a). This evaluation determined whether the commodity group was within the scope of license renewal. The staff found the methodology acceptable.

The staff reviewed the scoping process results documented in the scoping results report in accordance with the LRPGs. This documentation adequately described how the system or structure are meeting its 10 CFR 54.4(a) scoping criteria requirements. The staff also reviewed a sample of the applicant's scoping documentation and concluded that it had a level of detail appropriate to document the scoping process.

The staff reviewed the applicant's evaluation of plant insulation as documented in the license renewal results report and the bulk commodities AMR. The applicant indicated insulation as within the scope of license renewal and subject to an AMR based on the intended functions of heat transfer reduction and structural or functional support to nonsafety-related SCs the failure of which could prevent performance of safety-related functions. Both mirror and nonmirror insulation were evaluated. The staff finds the applicant's methods and conclusions on insulation acceptable.

The staff reviewed the scoping and screening of consumables and finds that the applicant followed the process described in SRP-LR and appropriately categorized consumables in accordance with the guidance. The applicant initially evaluated plant consumables for whether any met the criteria requiring an AMR (*e.g.*, structural sealants). Additionally, the applicant cited all industry guidelines (*e.g.*, NFPA standards) used as the basis for replacement of any item.

2.1.4.4.3 Conclusion

Based on its review of the LRA, mechanical system and structures results reports, scoping and

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

2.1.4.5 Mechanical Component Scoping

2.1.4.5.1 Summary of Technical Information in the Application

LRA Section 2.1 describes the methodology for identifying mechanical system components within the scope of license renewal. For mechanical systems, components that support system intended functions are within the scope of license renewal. For mechanical system scoping, the applicant defined a system as the collection of components in the component database assigned to the system code. The applicant determined system intended functions by the functions performed by those components. Definition of a system by database components is generally consistent with Maintenance Rule scoping documents and safety classification procedure. The applicant evaluated each mechanical system against 10 CFR 54.4 criteria to determine which system components performed intended functions consistent with the scoping criteria.

LRA Section 2.1.2.1.3, "Mechanical System Drawings," describes how the LRBDs are prepared to indicate system portions that support system intended functions within the scope of license renewal.

Boundary flags are marked with safety-to-nonsafety class breaks to indicate system intended function boundaries for system in-scope portions. Components within these boundary flags and class breaks support system intended functions within the scope of license renewal. Components subject to an AMR (*i.e.*, passive, long-lived components that support system intended functions) are highlighted with color coding to indicate which system AMR evaluated the components. Drawings with only highlighting and no boundary flags indicate that all components on the drawing support the system intended functions unless excluded by safety-to-nonsafety class breaks.

2.1.4.5.2 Staff Evaluation

The staff reviewed LRA Section 2.1 and the guidance in LRPGs, LRDs, and aging management reports to complete the review of mechanical scoping process. The program guidelines and aging management reports state instructions for evaluating individual mechanical system components by the scoping criteria. The applicant utilized CLB documents when determining whether a system or component is within the scope of 10 CFR 54.4(a). Examples of these sources included, but were not limited to, the UFSAR, Maintenance Rule database, separate ATWS, EQ, FP and SBO documents, technical specifications, and SERs. Additional sources of mechanical component information included the component database and individual system flow diagrams.

The applicant evaluated mechanical system diagrams to create license renewal boundaries for each system showing the in-scope components and evaluated components supporting

safety-related functions or regulated events further during the screening process for whether they should be subject to an AMR.

Nonsafety-related components connected to safety-related components and providing structural support at the safety/nonsafety interface or components the failure of which could prevent satisfactory accomplishment of a safety-related function due to spatial interaction with safety-related SSCs are included within the scope of license renewal and in the AMR for the 10 CFR 54.4(a)(2) evaluation but not specifically highlighted on the license renewal drawings. As part of the applicant’s verification process, the list of mechanical components within the scope of license renewal was compared to the data in the LRIS and the component database to confirm the scope of components in the system.

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

Scoping Methodology for the Main Steam System. LRA Section 2.3.4.2, “Main Steam,” states the scoping and screening methodology results for SSCs within the nonsafety-related MS system, which accomplishes the following scoping criteria of the Rule.

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

- Main steam isolation valve (MSIV) and MS line drain valve isolation support
- Provision of steam to HPCI turbine
- Maintenance of reactor coolant pressure boundary (RCPB) integrity up to and including the downstream MSIV
- MSIV leakage collection and release
- MS leak collection system isolation valve isolation support
- Maintenance of N_2 pressure boundary in containment
- Maintenance of the boundary between the reactor cavity and the MS lines during refueling, testing, and maintenance activities

The MS system has the following 10 CFR 54.4(a)(2) intended functions:

- Support of MS leak collection system operation by nonsafety-related MS line piping downstream of the MSIVs
- Maintenance of nonsafety-related component integrity so no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety

function

The MS system has the following 10 CFR 54.4(a)(3) intended functions:

- FP as credited in the 10 CFR Part 50 Appendix R safe shutdown analysis (10 CFR 50.48)
- Provision of steam to the HPCI and RCIC turbines during SBO (10 CFR 50.63)

As part of the audit, the staff reviewed the applicant's methodology for indicating MS mechanical component types meeting the scoping criteria as defined in the Rule. The staff also reviewed the scoping methodology implementation procedures and discussed the methodology and results with the applicant. The staff verified that the applicant had used pertinent engineering and licensing information to determine the MS mechanical component type within the scope of license renewal. As part of the review process, the staff evaluated each system intended function of the MS system, the basis for inclusion of the intended function, and the process for indicating the system components credited with intended functions. The staff verified that the applicant had highlighted system P&IDs to develop the system boundaries in accordance with 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 independently had verified the results in accordance with the governing procedures. Specifically, other license renewal personnel knowledgeable about the system independently had evaluated the marked-up drawings for accurate system intended functions. The applicant completed additional cross-discipline verification and independent evaluation of the highlighted drawings before final approval of the scoping.

2.1.4.5.3 Conclusion

Based on its review of the LRA, scoping implementation procedures, and a sample of mechanical component scoping results for the CS system, the staff concludes that the applicant’s methodology for identifying mechanical components within the scope of license renewal meets 10 CFR 54.4(a) requirements.

2.1.4.6 Structural Component Scoping

2.1.4.6.1 Summary of Technical Information in the Application

LRA Section 2.1 describes the methodology for identifying structures within the scope of license renewal. Initially the applicant identified all plant structures and SBO-related nonplant structures and structure intended functions from CLB documents (*e.g.*, the UFSAR, the Maintenance Rule document for buildings and structures, safety classification procedures, the fire hazards analysis, and the safe shutdown capability assessment). Structures with 10 CFR 54.4(a) intended functions were included within the scope of license renewal and listed in LRA Table 2.2-3, structures not within the scope of license renewal in LRA Table 2.2-4. LRA Section 2.4 describes the scoping results for individual structures within the scope of license renewal. LRA Section 2.4.3 describes various structures within the turbine building complex and yard structures and their seismic classifications based on design requirements. For example, manholes and duct banks were included within the scope of license renewal because they

support safety-related and nonsafety-related equipment within the scope of license renewal.

2.1.4.6.2 Staff Evaluation

The staff reviewed the applicant's approach to identifying structures relied upon for functions described in 10 CFR 54.4(a). In this review, the staff discussed the methodology with the applicant, reviewed the supporting documentation, and evaluated the scoping results for several structures within the scope of license renewal.

The LRPGs describe the applicant's process for identifying structures within the scope of license renewal and state that all structures with intended functions must be included and scoping results documented in the scoping results report, which lists all structures evaluated and describes the procedures for identifying them by use of the plant UFSAR, Maintenance Rule document, fire hazards analysis, and safe shutdown capability analysis.

The staff reviewed the applicant's implementation procedures and scoping results reports. Structural scoping considered all plant buildings, yard structures, and SBO related nonplant structures. The scoping results report specifies the intended function(s) for each structure required for compliance with one or more 10 CFR 54.4(a) criteria. Structural component intended functions were based on the guidance of NEI 95-10, and the SRP-LR. The applicant determined structure evaluation boundaries by developing a complete description of each structure as to its intended functions. The scoping results report documents a list of structures, evaluation results for the 10 CFR 54.4(a) criteria for each structure, a description of structural intended functions, and source reference information for the functions.

The staff conducted detailed discussions with the applicant's license renewal team and reviewed documentation pertinent to the scoping process. The staff assessed whether the scoping methodology outlined in the LRA and procedures had been implemented appropriately and whether the scoping results were consistent with CLB requirements. In these audit activities the staff found no discrepancies between the methodology documented and the implementation results.

2.1.4.6.3 Conclusion

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

2.1.4.7 Electrical Component Scoping

2.1.4.7.1 Summary of Technical Information in the Application

LRA Section 2.1.1, "Scoping Methodology," describes the scoping process for electrical systems and components. For purposes of system level scoping, plant electrical and I&C systems were included within the scope of license renewal. Electrical and I&C components in mechanical systems were included in the evaluation of electrical systems. LRA Section 2.1.1 refers to LRA Section 2.5, "Scoping and Screening Results: Electrical and Instrumentation and

Control Systems," which states that the default inclusion of plant electrical and I&C systems within the scope of license renewal reflects the method used for the scoping of electrical systems, which is different from the methods used for mechanical systems and structures. The applicant's approach to electrical and I&C components included components in the review unless specifically screened out. When used with the plant spaces approach, this method eliminated the need for unique identification of every component and its specific location and gave assurance no component was excluded from an AMR.

2.1.4.7.2 Staff Evaluation

As documented in the audit report, the staff evaluated LRA Sections 2.1.1 and 2.5 and the applicant's implementing procedures and aging management reports governing the electrical scoping methodology. The scoping phase for electrical components began with the placement within the scope of license renewal of all plant system electrical components and nonplant electrical systems including switchyard components required for SBO. Switchyard components required to restore offsite power also were included conservatively within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations for functions demonstrating compliance with SBO regulation (10 CFR 50.63). The staff determined that the data sources for scoping included the component data base, the station single line drawing, and the cable design procurement specifications. The staff reviewed portions of the data sources and selected several examples of components for which the applicant demonstrated the process for determining whether electrical components were within the scope of license renewal.

2.1.4.7.3 Conclusion

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

2.1.4.8 Conclusion for Scoping Methodology

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

2.1.5 Screening Methodology

2.1.5.1 General Screening Methodology

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

2.1.5.1.1 Summary of Technical Information in the Application

LRA Section 2.1.2, "Screening Methodology," describes the method of identifying components from in-scope systems and structures subject to AMRs. The screening consists of the following steps:

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

Active components were screened out and, therefore, required no AMR. The screening process also identified short-lived components and consumables. The short lived components are not subject to an AMR. Consumables are a special class of items that include packing, gaskets, component seals, O-rings, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Structural sealants for structures were the only consumables within the scope of license renewal requiring an AMR.

2.1.5.1.2 Staff Evaluation

Pursuant to 10 CFR 54.21, each LRA must contain an IPA that indicates SCs within the scope of license renewal subject to an AMR. The IPA must indicate components that perform intended functions without moving parts or a change in configuration or properties (passive) as well as components not subject to periodic replacement after a qualified life or specified time period (long-lived). The IPA describes and justifies the methodology for determining the passive and long-lived SCs and demonstrates that the effects of aging on those SCs will be adequately managed to maintain intended functions under all design conditions imposed by the plant-specific CLB for the period of extended operation.

The staff reviewed the applicant's methodology to determine whether mechanical and structural component types and electrical commodity groups within the scope of license renewal should be subject to an AMR. The applicant implemented a process for determining which SCs were subject to AMRs in accordance with 10 CFR 54.21(a)(1). LRA Section 2.1.2 describes the screening of component types and commodity groups within the scope of license renewal.

The screening process evaluated these in-scope component types and commodity groups to determine which were long-lived and passive and, therefore, subject to an AMR. The staff reviewed LRA Sections 2.3, 2.4, and 2.5, which presents the results of the process, and the screening results reports for the MS system and structures.

The applicant discussed with the staff the processes for each discipline and provided administrative documentation that describes the screening methodology. Specific methodology, mechanical, electrical, and structural, is addressed below.

2.1.5.1.3 Conclusion

Based on its review of the LRA, the screening implementation procedures, and a sampling of screening results, the staff determines that the applicant's screening methodology is consistent

with SRP-LR guidance and capable of identifying passive, long-lived components within the scope of license renewal and subject to an AMR. The staff determines that the applicant's process for identifying component types and commodity groups subject to an AMR meets 10 CFR 54.21 requirements and, therefore, is acceptable.

2.1.5.2 Mechanical Component Screening

2.1.5.2.1 Summary of Technical Information in the Application

LRA Section 2.1.2.1, "Screening of Mechanical Systems," describes the screening methodology for passive and long-lived mechanical components and their support structures subject to AMRs. License renewal drawings were prepared to indicate system portions that support system intended functions within the scope of license renewal (except systems within the scope of 10 CFR 54.4(a)(2) for physical interactions). In addition, the drawings show components subject to an AMR. Boundary flags in conjunction with safety-to-nonsafety class breaks indicate system intended function boundaries as noted on the drawings. All components within these boundary flags and class breaks support system intended functions within the scope of license renewal. Passive, long-lived components that support system intended functions are highlighted to indicate that they are subject to an AMR.

2.1.5.2.2 Staff Evaluation

As documented in the audit report, the staff evaluated the mechanical screening methodology in LRA 2.1.2.1, "Screening of Mechanical Systems," the LRDs, LRPGs, and the aging management reports. The mechanical system screening process began with the results from the scoping process. The applicant reviewed each mechanical system flow diagram for passive and long-lived components. To identify system components required to perform system intended functions, the applicant initially listed mechanical system components based on information from controlled system diagrams and the component database. The LRPGs and LRDs explain in detail how (1) to determine system boundaries, (2) to indicate components within specific flow paths required for intended functions, and (3) to determine system and interdisciplinary interfaces (*e.g.*, mechanical/structural, mechanical/electrical, structural/electrical). After entering these components into the LRIS database, from the component database the applicant confirmed that all system components had been considered. Where the mechanical system flow diagrams of large vendor-supplied components (*e.g.*, compressors, emergency diesel generators (EDGs)) were not in sufficient detail, the applicant reviewed component drawings or vendor manuals as necessary for individual components.

The staff reviewed the results of the boundary evaluation, discussed it with the applicant, and verified that mechanical system evaluation boundaries were established for each system within the scope of license renewal. The applicant determined these boundaries by mapping the pressure boundary of system-level license renewal intended functions onto the controlled system drawings. Mechanical component types were loaded into a scoping and screening database for further review for inclusion of all component types. For a component type not already in the LRIS, the applicant created a component type for use in the license database. A preparer and an independent reviewer comprehensively evaluated the boundary drawings for completeness and accuracy of the review results. As part of the evaluation, the applicant also benchmarked system passive and long-lived components against previous LRAs for similar

systems.

As part of the audit, the staff reviewed the applicant's methodology for determining which SCs meet the screening criteria of the Rule. The staff verified the applicant's implementation of the staff SRP guidance and RG 1.188 in the screening. The staff found that the applicant had developed sufficiently detailed procedures for the screening of mechanical systems, had implemented those procedures, and had documented the results adequately in aging management reports.

Additionally, the staff reviewed the screening of the MS and HPCI systems. The staff reviewed the system intended functions and source documents for the system, the MS and HPCI P&IDs, and the results documented in the aging management report. The staff found no discrepancies with the evaluation and determined that the applicant adequately followed the process documented in the LRDs and adequately documented the results in the aging management reports.

2.1.5.2.3 Conclusion

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

2.1.5.3 Structural Component Screening

2.1.5.3.1 Summary of Technical Information in the Application

LRA Sections 2.1.2.2 and 2.4 describe the methodology for structural screening. LRA Section 2.1.2.2 states that specific structural components are determined for each structure within the scope of license renewal from the CLB (drawings, etc.). Passive and long-lived structural components with intended functions were subject to an AMR. The applicant used the SRP-LR and NEI 95-10, Appendix B, for the identification of passive structural components. Structural components (*e.g.*, door, gate, pipe support, strut, or siding) were categorized as steel, threaded fasteners, concrete, fire barriers, elastomers, earthen structures, or fluoropolymers and lubrite sliding surfaces. LRA Section 2.4 summarizes the screening results for structures. For example, LRA Section 2.4.3 and LRA Table 2.4-3 summarize the screening results for manholes and duct banks. Structural components common to all structures (*e.g.*, mirror insulation) were categorized as bulk commodities. LRA Section 2.4.4 and LRA Table 2.4-4 summarize the screening results for structural bulk commodities.

2.1.5.3.2 Staff Evaluation

The staff reviewed the applicant's methodology for identifying structural components subject to an AMR by 10 CFR 54.21(a)(1). In this review, the staff discussed the methodology with the applicant, reviewed the supporting documentation, and evaluated the screening results for several structures within the scope of license renewal.

As described in the audit report, the applicant’s aging management reports details the applicant’s process for screening structural components subject to AMRs. The report states that all passive and long-lived structural components that perform intended functions are subject to AMRs. In addition, separate aging management reports describe the screening results for each system.

The staff reviewed the applicant's methodology for structural screening described in the noted LRA sections, the applicant’s implementation guidance, and its aging management reports. The applicant’s screening, in accordance with its implementation guidance, recorded pertinent structure design information, components, materials, environments, and aging effects. The staff verified that the applicant had used the lists of passive SCs in the regulatory guidance and supplemented them with additional items unique to the site or for which there were no direct matches (*i.e.*, material/environment combinations) to the generic lists.

The boundary for a structure was the entire building including base slabs, foundations, walls, beams, slabs, and steel superstructure. The aging management reports indicate for each individual SC whether the component is subject to an AMR and identifies it as a component, component type (*e.g.*, door, gate, anchor support, strut, or siding), or material. The applicant discussed with the staff in detail that the screening methodology as well as the screening reports for a selected group of structures.

2.1.5.3.3 Conclusion

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

2.1.5.4 Electrical Component Screening

2.1.5.4.1 Summary of Technical Information in the Application

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

The applicant determined that most electrical and I&C commodity groups are active and do not require an AMR. Two passive electrical and I&C commodity groups meet the 10 CFR 54.21(a)(1)(i) criterion (components that perform intended functions without moving parts or change in configuration):

- High-voltage insulators
- Cables and connections, bus, electrical portions of electrical and I&C penetration assemblies

Additionally, the applicant considered the pressure boundary function of some electrical and I&C components identified in NEI 95-10, Appendix B, (flow elements, vibration probes) in the mechanical AMRs as applicable. Electrical components supported by structural commodities (cable trays, conduit and cable trenches) were included in the structural AMRs.

The applicant reviewed the passive electrical components for those replaced based on a qualified life and therefore not subject to an AMR. The applicant determined that the components included in the EQ of the Electric Components Program per 10 CFR 50.49 (EQ) are replaced based on qualified life and, therefore are not subject to an AMR. The applicant determined that there would be AMRs for the passive, non-EQ electrical and I&C components.

2.1.5.4.2 Staff Evaluation

The staff reviewed the applicant's methodology for electrical screening in LRA Section 2.1.2.3 and the applicant's implementation procedures and aging management reports. The applicant used the screening process described in these documents for electrical commodity groups subject to AMRs. The applicant used the component database, the single-line drawings, and cable procurement specifications as data sources of electrical and I&C components including fuses-holders. The applicant determined there were no fuse-holders outside active devices and subject to an AMR.

The applicant assembled a table of seven commodities determined to meet the passive criteria. The seven commodities were grouped in accordance with NEI 95-10 as (1) cables and connections, (2) electrical portions of penetration assemblies, (3) metal-enclosed buses, (4) switchyard buses, (5) transmission conductors, (6) uninsulated ground conductors, and (7) high-voltage insulators. These seven commodities were grouped further as (1) high-voltage insulators and (2) cables and connections, buses, and electrical portions of electrical and I&C penetration assemblies as described in the LRA. The applicant evaluated passive commodities for whether they were subject to replacement based on a qualified life or specified time period (short-lived) or long-lived. The applicant determined that the remaining passive, long-lived components were subject to an AMR. The staff reviewed the screening of selected components to verify the correct implementation of the LRPGs and aging management reports.

2.1.5.4.3 Conclusion

The staff reviewed the LRA, procedures, electrical drawings, and a sample of the screening methodology results. The staff determined that the applicant's methodology was consistent with the description in the LRA and with the applicant's implementing procedures. Based on a review of information in the LRA, the applicant's screening implementation procedures, and a sampling review of electrical screening results, the staff finds the applicant's methodology for identification of electrical commodity groups subject to an AMR consistent with 10 CFR 54.21(a)(1) and, therefore, 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 of the SRP-LR and has

identified passive, long-lived components within the scope of license renewal and subject to an AMR. The staff concludes that the applicant's methodology is consistent with the requirements of 10 CFR 54.21(a)(1) and, therefore, acceptable.

2.1.6 Summary of Evaluation Findings

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

2.2 Plant-Level Scoping Results

2.2.1 Introduction

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

LRA Tables 2.2-1a, 2.2-1b, and 2.2-3 list respectively plant mechanical systems, electrical and I&C systems, and structures within the scope of license renewal. LRA Tables 2.2-2 and 2.2-4 list respectively plant mechanical systems and structures not within the scope of license renewal. Based on the DBEs considered in the plant's CLB, other CLB information as to nonsafety-related systems and structures, and certain regulated events, the applicant identified plant-level systems and structures within the scope of license renewal as defined by 10 CFR 54.4.

2.2.3 Staff Evaluation

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

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

The staff sampled the contents of the UFSAR based on the systems and structures listed in LRA Tables 2.2-1a, 2.2-1b, 2.2-2, 2.2-3, and 2.2-4 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 found no omissions.

2.2.4 Conclusion

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

2.3 Scoping and Screening Results: Mechanical Systems

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

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

In accordance with the requirements of 10 CFR 54.21(a)(1), the applicant 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 component drawings, focusing on components that have not been identified as within the scope of license renewal. The staff reviewed relevant licensing basis documents, including the UFSAR, for each

mechanical system to determine whether the applicant has omitted from the scope of license renewal components with intended functions delineated under 10 CFR 54.4(a). The staff also reviewed the licensing basis documents to determine whether the LRA specified all intended functions delineated under 10 CFR 54.4(a). The staff requested additional information to resolve any omissions or discrepancies identified.

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

In addition, the staff developed a "Two-Tier Scoping Review Process" to evaluate balance-of-plant (BOP) systems. There are 57 mechanical systems in the LRA among which 26 are BOP systems, that include most of the auxiliary systems and all the steam and power conversion systems. The staff performed a two-tier scoping review for these BOP systems.

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

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

Examples of the safety important/risk significant systems are the feedwater system, the emergency diesel generator (EDG) system, and the service water (SW) system based on the results of Individual Plant Examination (IPE) for JAFNPP. An example of a system whose failure could result in common cause failure of redundant trains is a drain system providing flood protection. Examples of systems with operating experience indicating likely passive failures include MS system, feedwater system, and SW system. Examples of systems with identified omissions in previous LRA reviews include fuel pool cooling and cleanup system, and makeup water sources to safety systems.

From the 26 BOP systems, the staff selected 16 systems for a Tier-2 (detailed) scoping review as described above. For the remaining 10 BOP systems, the staff performed a Tier-1 (not requiring detailed boundary drawings) review of the LRA and UFSAR that would identify apparent missing components for an AMR. However, Tier-2 requires the review of detailed boundary drawings in accordance with SRP-LR Section 2.3. The following is a list of the 10 Tier-1 systems:

- auxiliary boiler and accessories
- city water
- extraction steam
- feedwater heater vents and drains

- plumbing, sanitary and lab
- raw water treatment
- secondary plant drains
- steam seal
- turbine lube oil
- vacuum priming and air

The staff verified that there is no risk significant system in the above list by examining the results of the JAFNPP IPA. None of the above 10 systems are dominant contributors to core damage frequency (CDF), nor are these systems involved in the dominant initiating events.

The following is a list of the 16 Tier-2 systems:

- service water
- emergency diesel generator
- fuel oil
- fuel pool cooling and cleanup
- service, instrument and breathing air
- reactor building closed cooling water
- radwaste and plant drains
- security generator
- circulating water
- containment equipment drains
- main turbine generator
- sample
- turbine building closed loop cooling
- condensate
- main steam
- feedwater

2.3.1 Reactor Coolant System

LRA Section 2.3.1 states that the reactor coolant system (RCS), also called the nuclear boiler system, includes mechanical components in the following subsystems:

- reactor vessel (includes the reactor vessel and reactor vessel internals)
- reactor water circulation
- reactor vessel instrumentation
- recirculation flow control
- control rod drive
- neutron monitoring

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

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

The staff's findings on review of LRA Sections 2.3.1.1 – 2.3.1.3 are in SER Sections 2.3.1.1 – 2.3.1.3, respectively. The staff's review of the RCS subsystems proceeded as follows.

Summary of Technical Information in the Application. LRA Section 2.3.1 describes the RCS subsystems. Summaries of each subsystem follow.

Reactor Vessel System. The reactor vessel and internals make up the reactor vessel system. The purpose of the reactor vessel is to contain and support the reactor core and vessel internals and to provide a barrier to the release of radioactive materials from the core. The reactor vessel includes the vessel shell, top and bottom heads, nozzles and penetrations, internal and external attachments and vessel supports. The purpose of the reactor vessel internals is to properly distribute the flow of coolant delivered to the vessel, to locate and support the fuel assemblies, and to provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor pressure vessel. The reactor vessel internals include the core structure, shroud support assembly, control rod guide tubes, fuel support pieces, incore flux monitor guide tubes, steam dryer, guide rods, jet pump assemblies and jet pump instrumentation, core spray distribution lines, the differential pressure and liquid control line, surveillance sample holders, and feedwater spargers.

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

Reactor Water Recirculation. The purpose of the reactor water recirculation system is to provide a variable moderator (coolant) flow to the reactor core for adjusting reactor power level.

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

Reactor Vessel Instrumentation. The purpose of reactor vessel instrumentation is to monitor reactor vessel parameter information to ensure sufficient control of the key parameters to facilitate safe operation of the plant. Measurements of temperature, pressure, differential pressure, flow, level and core power are transmitted to protective systems, control systems and to the reactor control room for operator information. Mechanical portions of the system support the measurement of hydraulic parameters. Piping from the reactor vessel and recirculation system passes outside primary containment to the reactor building where most sensors are located. The reactor vessel instrumentation system also includes unused primary containment piping penetrations.

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

Recirculation Flow Control. The purpose of the recirculation flow control system is to control the

speed of the two reactor water recirculation pumps by varying the electrical frequency of the power supply for the pumps. A variable frequency, alternating current (AC) motor-generator set located outside the drywell supplies power to each recirculation pump motor. The pump motor is electrically connected to the generator and is started by engaging the variable speed coupling between the generator and its drive motor. By varying the coolant flow rate through the core, power level may be changed. The system is arranged to allow manual control room operator action. The rotating inertia of the motor-generator set supports a slow coastdown of flow following some transients; however, the recirculation flow control system is not credited in any of the design basis events.

The failure of nonsafety-related recirculation flow control system SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

Neutron Monitoring. The purpose of the neutron monitoring traversing incore probe (TIP) subsystem is to provide a signal proportional to the neutron flux, at any axial location wherever power range detector assemblies are located. Each TIP channel (or subsystem) uses a gamma detector attached to a titanium-sheathed signal and drive cable, which is driven from outside the primary containment by a drive mechanism. The flexible cable is contained by guide tubes that continue into the reactor core. The guide tubes are a part of the power range detector assembly. The TIP subsystem includes QA I primary containment isolation valve assemblies on each guide tube entering the primary containment. These valves are closed except when the TIP subsystem is in operation, or to support system testing or maintenance activities. Each isolation valve assembly consists of a ball valve that closes when the TIP probe is withdrawn and a cable shearing valve that can shear off the probe if containment isolation is required. The valves are part of the containment boundary. Otherwise, this is an instrumentation system.

The neutron monitoring TIP system has safety-related components relied upon to remain functional during and following DBEs.

Control Rod Drive System. The purpose of the CRD system is to provide reactivity control by positioning the control rods to control power generation in the core. When required, the control rod drive system is designed to insert the control rods with sufficient speed to limit fuel barrier damage. The control rod drive system includes the control rod blades, the control rod drive mechanisms, and the components, piping and valves of the control rod drive hydraulic system.

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

LRA Table 2.3.3-14-3 identifies the following CRD system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- flow element
- heat exchanger (shell)
- orifice

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

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

LRA Table 2.3.3-14-2 identifies the following RCS component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- flow element
- heat exchanger (shell)
- orifice
- piping
- pump casing
- sight glass
- strainer housing
- tubing
- valve body

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

Staff Evaluation. The staff reviewed LRA Section 2.3.1 and UFSAR Sections 3.3, 3.5, 4.2, 4.2.5, 4.3, 7.5.9, 7.8, and 7.9 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3, "Scoping and Screening Results: Mechanical Systems."

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

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

those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.1 Reactor Vessel

2.3.1.1.1 Summary of Technical Information in the Application

LRA Section 2.3.1.1 describes the reactor vessel, which contains the nuclear fuel core, core support structures, control rods, and other parts of the reactor core. The major components of the reactor vessel include the reactor vessel shell, lower head, upper closure head, flanges, studs, nuts, nozzles and safe ends.

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

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

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

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

2.3.1.1.2 Staff Evaluation

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

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

2.3.1.1.3 Conclusion

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

2.3.1.2 Reactor Vessel Internals

2.3.1.2.1 Summary of Technical Information in the Application

LRA Section 2.3.1.2 describes the reactor vessel internals, which are installed inside the reactor pressure vessel to properly distribute the flow of coolant delivered to the vessel, to locate and support the fuel assemblies, and to provide an inner volume containing the core that can be flooded following a break in the nuclear system process barrier external to the reactor pressure vessel.

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

- control rod guide tubes
- core spray lines
- core support
- core support rim bolts
- fuel support pieces
- incore flux monitors
- jet pump assemblies
- jet pump castings
- shroud
- shroud stabilizers
- shroud support
- steam dryers
- top guide assembly

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

- flow distribution
- boundary of a volume in which the core can be flooded and adequately cooled in the event of a breach in the nuclear system process barrier external to the reactor vessel
- pressure boundary
- structural or functional support for safety-related equipment
- structural integrity so loose parts are not introduced

2.3.1.2.2 Staff Evaluation

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

During its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that

the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.1.2.3 Conclusion

The staff reviewed the LRA 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 within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.1.3 Reactor Coolant Pressure Boundary

2.3.1.3.1 Summary of Technical Information in the Application

LRA Section 2.3.1.3 describes the RCPB. The following systems, in whole or in part, comprise the RCPB:

- control rod drive
- core spray
- feedwater
- high-pressure coolant injection
- main steam
- nuclear boiler vessel instruments
- reactor core isolation cooling
- reactor water recirculation
- reactor water cleanup
- residual heat removal
- standby liquid control

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

- bolting
- condensing chambers
- drive
- driver mount
- filter housing
- flow elements
- orifices
- piping and fittings less than 4 inches nominal pipe size (NPS)
- piping and fittings greater than or equal to 4 inches NPS
- pump casing and cover
- pump cover thermal barrier
- restrictors
- rupture disc

- tank (CRD accumulator)
- tank (CRD scram discharge volume)
- thermal sleeves (FW)
- thermowells less than 4 inches NPS (NBVI, RWR)
- tubing
- valve bodies less than 4 inches NPS
- valve bodies greater than or equal to 4 inches NPS

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

- flow control or spray pattern
- pressure boundary

2.3.1.3.2 Staff Evaluation

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

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

2.3.1.3.3 Conclusion

The staff reviewed the LRA 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 RCPB components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2 Engineered Safety Features

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

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

- 2.3.2.1 residual heat removal
- 2.3.2.2 core spray system
- 2.3.2.3 automatic depressurization
- 2.3.2.4 high pressure coolant injection
- 2.3.2.5 reactor core isolation cooling

- 2.3.2.6 gas handling
- 2.3.2.7 primary containment penetrations

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

2.3.2.1 Residual Heat Removal System

2.3.2.1.1 Summary of Technical Information in the Application

LRA Section 2.3.2.1 describes the RHR system, which restores and maintains the coolant inventory in the reactor vessel so that the core is adequately cooled after a loss of coolant accident (LOCA) and cools the core during a normal shutdown. The system also cools the containment for condensation of steam from blowdowns in design basis LOCAs. In addition, the RHR service water system reliably supplies cooling water for RHR under post-accident and shutdown conditions. The RHR system has the following modes of operation: (1) low-pressure coolant injection, (2) containment spray, (3) steam condensing, (4) shutdown cooling, (5) alternate shutdown cooling, (6) suppression pool cooling, (7) fuel pool cooling, and (8) RHR service water to RHR cross tie.

In low-pressure coolant injection mode, the RHR system restores and maintains the coolant inventory in the reactor vessel after a LOCA. The containment spray mode reduces drywell pressure following a LOCA. In the containment spray mode, the RHR pumps transfer water from the suppression chamber through the RHR heat exchangers and heat exchanger bypass lines, where the RHR service water removes heat. The cool water is diverted to two redundant spray headers to lower drywell and containment pressure. The steam condensing mode may be operated in conjunction with the RCIC system as directed by emergency operating procedures in case of a loss of the main condenser. During reactor isolation, reactor steam may be relieved via the relief valves to the suppression chamber where it is condensed and subcooled. Decay heat is transferred to the RHR service water by the RHR heat exchangers used as direct steam condensers. The shutdown cooling mode during normal shutdown and cooldown dumps steam from the reactor vessel to the main condenser acting as a heat sink. The RHR pumps complete reactor cooldown by pumping reactor coolant from recirculation loop B through the RHR heat exchangers, which transfer heat to RHR service water. The cooled reactor coolant returns to the reactor vessel via either recirculation loop. The alternate shutdown cooling mode provides a cooling path if the normal shutdown cooling path is inoperable. The RHR pumps take suction from the suppression pool, pass it through the RHR heat exchangers, and inject it into the vessel via the RHR injection valves. Water overflows into the MS lines, and safety relief valves (SRVs) open for flow to the suppression pool. The suppression pool cooling mode of RHR takes suction from the suppression pool, passes it through the RHR heat exchangers, and returns flow to the suppression pool. This mode of operation is designed to remove heat from the suppression pool. The fuel pool cooling mode takes suction from the fuel pool cooling system, passes it through the RHR heat exchangers, and discharges it back to the fuel pool cooling system. This mode of operation assists in fuel pool cooling during reactor shutdown periods as an alternate cooling system operation and is not a safety function. The emergency reactor vessel fill mode provides a cross-tie between the RHR service water system and RHR piping. The RHR service water pumps take suction from the service water system and inject it into the reactor vessel through the RHR piping.

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

LRA Tables 2.3.2-1 and 2.3.3-14-4 identify the following RHR system component types within the scope of license renewal and subject to AMR:

- bolting
- cyclone separator
- flow element
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tubes)
- nozzle
- orifice
- piping
- pump casing
- sight glass
- steam trap
- strainer
- strainer housing
- thermowell
- tubing
- valve body

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

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.2.1.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.1 and 2.3.3.14, and UFSAR Sections 4.8.1, 4.8.3, 4.8.4, 4.8.5, and 9.7.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

2.3.2.1.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.2 Core Spray System

2.3.2.2.1 Summary of Technical Information in the Application

LRA Section 2.3.2.2 describes the CS system, which protects the core by spraying water over the fuel assemblies to remove decay heat following the postulated design basis LOCA. As part of the ECCS, the CS system maintains core coolant inventory to prevent fuel damage and, in conjunction with the primary and secondary containments, limit the release of radioactive materials to the environs following a LOCA to keep resulting radiation exposures within 10 CFR Part 100 guideline values. The CS system consists of two redundant pumping loops, each with a motor-driven centrifugal pump, piping, valves, spray spargers, control logic, and instrumentation and controls. The pump suction is normally supplied from the suppression pool but may be lined up to the condensate storage tank (CST) after reactor shutdown. The CST supports CS system operation for injection flow testing, for transfer of condensate to the reactor, or for core cooling. During LOCA-initiated CS operation, the CS pumps take suction from the suppression pool and discharge water over the top of the core. Water leaks through the break in the RCPB into the drywell. The leaking water drains through the pressure suppression vents back to the suppression pool, establishing a closed loop. The CS keep-full subsystem keeps the CS system discharge piping full. The subsystem consists of a hold pump with its associated piping, valves, instruments, and controls.

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

LRA Tables 2.3.2-2 and 2.3.3-14-8 identify the following CS system component types within the scope of license renewal and subject to AMR:

- bolting
- cyclone separator
- flow element
- orifice
- piping
- pump casing
- sight glass

- strainer
- tubing
- valve body

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

- flow control
- filtration
- pressure boundary

2.3.2.2.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.2 and 2.3.3.14, and UFSAR Section 6.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

Based on its review, the staff found that LRA Section 2.3.2.2 includes within the scope of license renewal CS system portions that meet 10 CFR 54.4 scoping requirements. LRA Table 2.3.2-2, “Core Spray System,” also includes CS system components subject to an AMR by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1). The staff found no omissions.

2.3.2.2.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 CS system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.3 Automatic Depressurization

2.3.2.3.1 Summary of Technical Information in the Application

LRA Section 2.3.2.3 describes the automatic depressurization system (ADS), which prevents over-pressurization of and provides automatic depressurization for small breaks in the reactor coolant system, allowing the low-pressure coolant injection and CS systems to inject water into the reactor vessel. The system includes safety relief valves (SRVs), the SRV discharge lines to the suppression pool, and the MS lines from the reactor vessel out to but not including the first MS isolation valve. The SRVs are on the MS lines within the drywell between the reactor vessel and the first MS isolation valves. The valves are dual-purpose in that they relieve pressure by

normal mechanical action or by automatic action of an electric-pneumatic control system. The relief by normal mechanical action prevents over-pressurization of the reactor coolant system. The depressurization by automatic action of the control system reduces reactor coolant system pressure during a small-break LOCA.

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

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

- bolting
- piping
- T-quencher
- valve body

The ADS component intended function 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 UFSAR Sections 4.4, 6.4.2, and 7.4.3.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

The staff's review of LRA Section 2.3.2.3 found 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 follows.

In RAI 2.3.2.3-1 dated January 12, 2006, the staff noted that UFSAR page 498 states that each of the 11 SRVs has a nitrogen accumulator. Such pneumatic accumulators ensure SRV ability to depressurize the vessel in the event of a small to intermediate line break concurrent with an HPCI failure and an interruption of the pneumatic supply to the accumulators for short-term ADS SRV capability. Long-term operation of the SRVs is assured with the seismically-qualified lines to the accumulators. LRA Table 2.3.2-3 does not list accumulators as within the scope of license renewal; therefore, the staff asked the applicant to indicate whether the accumulators had been included within the scope of license renewal and, if so, the LRA table and subcomponent group that include the subject component or, if not, to justify the exclusion.

In its response dated February 12, 2007, the applicant stated that the accumulators are included within the scope of license renewal as part of the service, instrument, and breathing air system as shown on license renewal drawing FM-29A and in LRA Tables 2.3.3-10 and 3.3.2-10

as a component type of tank exposed to an internal environment of gas.

Based on its review, the staff finds the applicant's response to RAI 2.3.2.3-1 acceptable because of the inclusion of the component. 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 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 ADS components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.4 High-Pressure Coolant Injection

2.3.2.4.1 Summary of Technical Information in the Application

LRA Section 2.3.2.4 describes the HPCI system, which limits the release of radioactive materials to the environs following a LOCA to keep radiation exposures within 10 CFR Part 100 guideline values. This limited release is achieved primarily by maintaining core coolant inventory to prevent fuel damage. The HPCI system consists of a steam turbine-driven centrifugal main pump, a booster pump, piping, valves, controls, and instrumentation. The HPCI system is designed to pump water into the reactor vessel over a wide range of pressures. The system uses demineralized water supplied by a common header from the two CSTs and can also draw from the suppression pool, pumping water from either source into the reactor vessel via a feedwater line. Flow is distributed within the reactor vessel through feedwater spargers. The HPCI system turbine gland seals are vented to the HPCI system gland seal condenser and part of the water from the HPCI system booster pump is routed through the condenser for cooling purposes. Non-condensable gases from the gland seal condenser are vented by a gland exhauster to the standby gas treatment system. An HPCI lube oil system supplies the main pump, turbine (including thrust bearing), and speed reducer bearings with oil. A motor-driven pump supplies the lube oil system when speed is too low for the shaft-driven pump. This system contains a lube oil cooler supplied with water from the booster pump discharge.

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

LRA Tables 2.3.2-4 and 2.3.3-14-14 identify the following HPCI system component types within the scope of license renewal and subject to AMR:

- bearing housing
- blower housing
- bolting

- drain pot
- filter housing
- flow element
- gear box housing
- governor housing
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tubes)
- orifice
- piping
- pump casing
- rupture disk
- sight glass
- steam trap
- strainer
- tank
- thermowell
- tubing
- turbine casing
- valve body

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

- filtration
- flow control
- heat transfer
- pressure boundary

2.3.2.4.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.4 and 2.3.3.14, and UFSAR Sections 6.4 and 8.11 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

2.3.2.4.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 HPCI system

components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.5 Reactor Core Isolation Cooling

2.3.2.5.1 Summary of Technical Information in the Application

LRA Section 2.3.2.5 describes the RCIC system, which cools the core during reactor isolation by pumping makeup water into the reactor vessel when its water level is low. The RCIC system also provides makeup water to the reactor vessel during total loss of offsite power. The RCIC system consists of a steam-driven turbine-pump unit, valves, and piping capable of delivering make-up water to the reactor vessel. The RCIC system normally takes suction from the demineralized water in the CSTs with back-up supply available from the suppression pool. The RCIC system also connects to the RHR system alignment with it when the RHR system operates in the steam condensing mode. RCIC injection to the vessel is through the feedwater line. The RCIC system shares suction points and full-flow test lines with the HPCI system.

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

LRA Tables 2.3.2-5 and 2.3.3-14-7 identify the following RCIC system component types within the scope of license renewal and subject to AMR:

- bolting
- filter housing
- flow meter housing
- governor housing
- heat exchanger (bonnet)
- heat exchanger (shell)
- orifice
- piping
- pump casing
- rupture disk
- sight glass
- steam trap
- strainer
- strainer housing
- tank
- thermowell
- tubing
- turbine casing
- valve body

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

- flow control

- filtration
- pressure boundary

2.3.2.5.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.5 and 2.3.3.14, and UFSAR Section 4.7 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

Based on its review, the staff found that LRA Section 2.3.2.5 includes within the scope of license renewal RCIC portions that meet 10 CFR 54.4 scoping requirements. LRA Table 2.3.2-5, “Reactor Core Isolation Cooling,” also includes RCIC components subject to AMRs by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1). The staff found no omissions.

2.3.2.5.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 RCIC system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.6 Gas Handling

2.3.2.6.1 Summary of Technical Information in the Application

LRA Section 2.3.2.6 describes the gas-handling system, which includes mechanical components in the off-gas-holdup (OGH) and SGT subsystems. The OGH system collects, processes, holds, and controls the gaseous radioactive waste released from the main condenser air ejector. Discharge of this gas to the atmosphere is through the main stack, which is also the release point for gaseous waste from the start-up mechanical vacuum pump (condenser air removal pump) and the gland seal condenser (steam packing exhauster). The SGT system processes gaseous effluent from the primary and secondary containments when required to limit the discharge of radioactive materials to the environs and limit exfiltration from the secondary containment during periods of primary containment isolation. The system functions as part of the secondary containment system. The SGT system is designed to limit the release of radioactive material to the environment to keep the offsite dose from a postulated DBA within 10 CFR Part 100 or 10 CFR 50.67(b)(2) limits. During normal plant operation, the SGT system treats potentially radioactive gases prior to discharge to the environment.

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

LRA Tables 2.3.2-6 and 2.3.3-14-1 identify the following gas handling system component types within the scope of license renewal and subject to AMR:

- bolting
- damper housing
- duct
- fan housing
- filter
- filter unit housing
- flow element
- orifice
- piping
- sight glass
- tubing
- valve body

The gas-handling system component intended functions within the scope of license renewal include:

- flow control
- filtration
- pressure boundary

2.3.2.6.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.6 and 2.3.3.14, and UFSAR Sections 5.3.3.4 and 11.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

Based on its review, the staff found that LRA Section 2.3.2.6 includes within the scope of license renewal SGT system portions that meet 10 CFR 54.4 scoping requirements. LRA Table 2.3.2-6, “Standby Gas Treatment System Components Subject to Aging Management Review,” also includes SGT system components subject to an AMR by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1) The staff found no omissions.

2.3.2.6.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 gas handling system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.2.7 Primary Containment Penetrations

2.3.2.7.1 Summary of Technical Information in the Application

LRA Section 2.3.2.7 describes the primary containment penetrations system, which limits the release of fission products in the event of a postulated DBA so that offsite doses do not exceed 10 CFR Part 100 guideline values. The primary containment system is of the pressure suppression type and houses the reactor vessel, the reactor recirculating loops, and other branch connections of the reactor coolant system. The system includes a drywell, a pressure suppression chamber which stores a large volume of water, the connecting vent system between the drywell and the pressure suppression pool, isolation valves, the vacuum relief system, the RHR subsystems for containment cooling, and instrumentation and instrument connections for periodic integrated containment leakage rate tests during reactor shutdowns.

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

LRA Tables 2.3.2-7 and 2.3.3-14-10 identify the following primary containment penetrations system component types within the scope of license renewal and subject to AMR:

- bolting
- piping
- tubing
- valve body

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

2.3.2.7.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.2.7 and 2.3.3.14, and UFSAR Section 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 UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in

accordance with the requirements of 10 CFR 54.21(a)(1).

Based on its review, the staff found that LRA Section 2.3.2.7 includes within the scope of license renewal primary containment penetration portions that meet 10 CFR 54.4 scoping requirements. LRA Table 2.3.2-7, “Primary Containment Penetrations,” also includes primary containment penetration components subject to an AMR by 10 CFR 54.4(a) and 10 CFR 54.21(a)(1) The staff found no omissions.

2.3.2.7.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 primary containment penetrations system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3 Auxiliary Systems

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

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

- 2.3.3.1 standby liquid control
- 2.3.3.2 service water
- 2.3.3.3 emergency diesel generator
- 2.3.3.4 fuel oil
- 2.3.3.5 fire protection - water
- 2.3.3.6 fire protection - CO_2
- 2.3.3.7 heating, ventilation, and air conditioning
- 2.3.3.8 containment purge, containment atmosphere dilution, and post-accident sampling
- 2.3.3.9 fuel pool cooling and cleanup
- 2.3.3.10 service, instrument, and breathing air
- 2.3.3.11 reactor building closed loop cooling water
- 2.3.3.12 radwaste and plant drains
- 2.3.3.13 security generator
- 2.3.3.14 miscellaneous systems in scope for (a)(2)

The staff's findings on review of LRA Sections 2.3.3.1 – 2.3.3.14 are in SER Sections 2.3.3.1 -

2.3.3.14, respectively.

2.3.3.1 Standby Liquid Control

2.3.3.1.1 Summary of Technical Information in the Application

LRA Section 2.3.3.1 describes the SLC system, a backup method to bring and maintain the reactor subcritical from the most reactive conditions as reactor coolant cools. Maintaining subcriticality thus ensures that the fuel barrier is not threatened by overheating in the improbable event that not enough control rods can be inserted to counteract the positive reactivity effects of a colder moderator. The SLC system consists of a stainless steel boron solution tank, a test water tank, a drain tank, two positive-displacement pumps, two explosive valves, local valves, and controls mounted in the reactor building outside the primary containment. The liquid flows through stainless steel piping into the reactor vessel and discharges below the core support plate where it mixes with the cooling water rising through the core.

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

LRA Tables 2.3.3-1 and 2.3.3-14-5 identify the following SLC component types within the scope of license renewal and subject to AMR:

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

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

2.3.3.1.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.1 and 2.3.3.14, and UFSAR Section 3.9 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During its review, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that

the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.1.3 Conclusion

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

2.3.3.2 Service Water

2.3.3.2.1 Summary of Technical Information in the Application

LRA Section 2.3.3.2 describes the service water (SW) system, which provides cooling water to safety-related and nonsafety-related plant components. The SW system is a heat sink during normal operation for the turbine building and reactor building heat loads. Three nonsafety-related pumps in the screenwell-pumphouse building take suction from Lake Ontario. Two pumps normally operate and discharge through automatic self-cleaning strainers into a common manifold. The return flow from the system enters the circulating water discharge tunnel where it mixes with the circulating water flowing back into Lake Ontario. The emergency SW system cools ECCS components and other equipment essential to safe reactor shutdown following a design basis LOCA. The emergency SW system consists of two independent supply loops, each supplied from one emergency service water pump in a separate bay in the pumphouse, taking suction from Lake Ontario. Twin basket strainers are located at each pump discharge. When in operation, the system discharges to the circulating water discharge tunnel and back to Lake Ontario. The control room and relay room air handling units, normally supplied cooling flow by a closed loop glycol system, also can be supplied by either the emergency or normal SW system.

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

LRA Tables 2.3.3-2 and 2.3.3-14-30 identify the following SW system component types within the scope of license renewal and subject to AMR:

- bolting
- flow element
- orifice
- piping
- pump casing
- strainer
- strainer housing

- tank
- thermowell
- tubing
- valve body

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

- flow control
- filtration
- pressure boundary

2.3.3.2.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.2 and 2.3.3.14, and UFSAR Section 9.7 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review fo the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Sections 2.3.3.2 and 2.3.3.14 found 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 follows.

In RAI 2.3.3.2-1 dated January 19, 2007, the staff noted that license renewal drawing LRA-M-46A shows at locations B6, B7, and B8 four isolation valves for the drain lines and four isolation valves on SW supply lines to the electrical bay cooling units. The license renewal boundary for each section of piping ends at the QA-I boundary including the reducer; however, the isolation valves (at each supply line and at each drain line) upstream of the reducer and piping between the reducer and isolation valves labeled as SEISMIC I are not shown as within the scope of license renewal. The staff requested from the applicant additional information on why these piping and isolation valves are not within the scope of license renewal and justification for the boundary locations as to 10 CFR 54.4(a) requirements.

In its response dated February 14, 2007, the applicant stated that the license renewal drawings identify the SEISMIC I boundaries uniquely. The portions of the system required to maintain pressure boundary for the system to perform its safety intended functions are identified in the site component database as QA-I and within the system intended function boundary flags. The SEISMIC I boundary identifies portions of the system that are seismically qualified category I but not necessarily safety-related or QA-I. The portions of the system that were included in the AMR, as shown by the highlighting on the license renewal drawing, include those required to maintain the pressure boundary so functions defined in 10 CFR54.4(a)(1) or (a)(3) can be performed.

The applicant also indicated in response to this RAI that the determination of whether a component meets the 10 CFR 54.4(a)(2) scoping criterion is based on structural/seismic boundary locations or the component location in a building, whether it contains gas or liquid, and its proximity to safety-related equipment. The applicant also stated that their conservative spaces approach to scoping in accordance with 10 CFR 54.4(a)(2) included almost all mechanical systems within the scope of license renewal (see Table 2.3.3.14-A). System portions beyond the QA-I boundary shown as SEISMIC I were included within the scope of license renewal in the 10 CFR54.4(a)(2) review but are not highlighted on license renewal drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-1 acceptable because it confirmed inclusion of the SEISMIC I category SW piping in question within the scope of license renewal and subject to an AMR; therefore, the staff's concern described in RAI 2.3.3.2-1 is resolved.

In RAI 2.3.3.2-2 dated January 19, 2007, the staff noted that license renewal drawing LRA-FM-20B shows, at location E5, SW piping 22"-WS-151-57 as within the scope of license renewal. The line is continued on license renewal drawing LRA-FM-46A, at location B5. The continuation on license renewal drawing LRA-FM-46A does not show the piping as within the scope of license renewal nor include a license renewal boundary. The line is continued on a third drawing, license renewal drawing LRA-FM-36A, not provided by the applicant. The staff requested from applicant additional information on why this section of piping is not within the scope of license renewal and justification for the boundary locations under 10 CFR 54.4(a).

In its response dated February 14, 2007, the applicant stated that the piping on license renewal drawings LRA-FM-6A and LRA-FM-36A is the discharge pipe from the SW system to the circulating water discharge. Pressure boundary integrity is not required for this portion of the system because this piping is downstream of the cooled components. This piping is, therefore, not subject to an AMR as part of the SW system review. As explained in LRA Section 2.1.2.1.3, piping required for structural support or for potential spatial interaction with safety-related equipment was included in the 10 CFR 54.4(a)(2) review but not highlighted on the license renewal drawings,.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-2 acceptable because it adequately described the SW piping in question continued on license renewal drawing LRA-FM-36A previously unavailable for review. The staff accepts the applicant's explanation that this piping is downstream from all safety-related components, is not required for pressure integrity, and, therefore, is not within the scope of license renewal for 10 CFR 54.4(a)(1) or (a)(3). Therefore, the staff's concern described in RAI 2.3.3.2-2 is resolved.

In RAI 2.3.3.2-3 dated January 19, 2007, the staff noted that license renewal drawing LRA-M-46A shows, at location C4, SW piping 8" WCS-151-114 continued from license renewal drawing LRA-FM-15A, location C1. Valve ESW-23 and piping upstream are labeled QA-I. Neither of the continuation drawings (LRA-FM-15A and LRA-FM-36A) was submitted as part of the LRA. The staff requested from the applicant additional information as to why this section of QA-I piping from valve ESW-23 and upstream are not within the scope of license renewal and justification for the boundary locations under 10 CFR 54.4(a).

In its response dated February 14, 2007, the applicant stated that valve ESW-23 and the attached piping are the discharge of the reactor building closed loop cooling water system to the SW discharge piping. The drawing showed these components incorrectly as QA-I. They are no longer classified as safety-related because this flow path is not needed for that system's intended functions. Piping required for structural support or for potential spatial interaction with safety-related equipment was included in the 10 CFR 54.4(a)(2) review but not highlighted on the license renewal drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-3 acceptable because it correct the initial submission. The QA-I classification on the drawing submitted with the LRA was in error. As this section of piping in not QA-1, the staff agrees that the piping is not subject to an AMR for 10 CFR54.4(a)(1) or (a)(3); therefore, the staff's concern described in RAI 2.3.3.2-3 is resolved.

In RAI 2.3.3.2-4 dated April 25, 2007, the staff requested from the applicant additional information specifying what SW system portion is included within the 10 CFR 54.4(a)(2) scope of license renewal. The information was requested because SW system SSCs are located in many areas of the plant, and the information in the LRA was not detailed sufficiently to determine whether any SSCs that should have been included within the scope of license renewal per 10 CFR 54.4(a)(2) had been omitted.

In its response dated May 17, 2007, the applicant indicated that the passive mechanical components within the 10 CFR 54(a)(2) scope of license renewal were the SW system components located in the cable tunnel, EDG building, electric bay area, motor-generator set room, primary containment, reactor building, gas treatment building, screenwell house, SW pump house, and turbine building. The applicant also indicated that SW SSCs in the auxiliary boiler building, in the turbine building below elevation 260 and on elevation 260 outside grid coordinates 260-8D through 13G, and in the pump house in areas below elevation 255 or areas on elevation 272 outside coordinates SW272-25A, 26A are not within the 10 CFR 54.4(a)(2) scope of license renewal because there are no safety-related components in these buildings or areas.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.2-4 acceptable because it clearly specified the plant areas with SW system SSCs and included within the 10 CFR 54.4(a)(2) scope of license renewal SW SSCs in all the areas of the plant with potential spatial interaction with safety-related components. The staff's concern described in RAI 2.3.3.2-4 is resolved.

2.3.3.2.3 Conclusion

The staff reviewed the LRA, accompanying license renewal drawings, and RAI responses to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 SW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.3 Emergency Diesel Generator

2.3.3.3.1 Summary of Technical Information in the Application

LRA Section 2.3.3.3 describes the EDG system, which supplies onsite AC power adequate for the safe shutdown of the reactor following abnormal operational transients and postulated accidents. The EDG system includes four diesel generator units, each with an air start system and fuel oil system. Each EDG includes several mechanical auxiliary systems that support operation. Each engine has a closed-loop jacket water cooling system which circulates corrosion-inhibiting coolant through the engine cylinder liners, lube oil cooler, and turbocharger after-coolers during engine operation. Each engine is equipped with three engine-driven lube oil gear pumps, which circulate clean, cool lubricating oil during engine operation. Each engine has a combustion air intake system, which draws air through the air intake filter from a hooded opening in the EDG building roof into the compressor side of the turbocharger. The exhaust system, consisting of the turbocharger, muffler, piping, and expansion joint, removes the combustion gases through the roof.

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

LRA Tables 2.3.3-3 and 2.3.3-14-41 identify the following EDG system component types within the scope of license renewal and subject to AMR:

- bolting
- compressor housing
- duct
- duct flexible connection
- expansion joint
- filter housing
- heat exchanger (bonnet)
- heat exchanger (fins)
- heat exchanger (housing)
- heat exchanger (shell)
- heat exchanger (tubes)
- heater housing
- lubricator housing
- motor housing
- muffler
- orifice
- piping
- pump casing
- sight glass
- strainer
- strainer housing
- tank
- thermowell

- tubing
- valve body

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

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.3.3.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.3 and 2.3.3.14, Sections 2.2 and 3.1.51 of Entergy Report No. FAF-RPT-05-AMM30, and UFSAR Sections 8.6.1, 8.6.2, 8.6.3, and 8.6.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.3.3 Conclusion

The staff reviewed the LRA 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 EDG system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.4 Fuel Oil

2.3.3.4.1 Summary of Technical Information in the Application

LRA Section 2.3.3.4 describes the fuel oil system, which stores and transfers fuel oil to the EDG and fire protection systems. Fuel oil system components include bulk storage tanks, day tanks, transfer pumps, piping, and valves. Each diesel generator unit has an independent fuel oil system with a main fuel storage tank, a day tank, and pumps. Two full-capacity motor-driven pumps fill the day tank from the storage tank. An engine-driven pump and a direct current (DC) motor-driven pump move fuel from the day tank to the fuel injectors as two redundant engine fuel pumping systems.

The fuel oil system has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related fuel oil SSCs potentially could prevent the

satisfactory accomplishment of a safety-related function. In addition, the fuel oil system performs functions that support fire protection.

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

- bolting
- flame arrestor
- flow meter housing
- injector housing
- piping
- pump casing
- strainer
- strainer housing
- tank
- tubing
- valve body

The fuel oil system component intended functions within the scope of license renewal include:

- flow control
- filtration
- pressure boundary

2.3.3.4.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.4 and UFSAR Sections 8.6 and 9.8.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.4.3 Conclusion

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

2.3.3.5 Fire Protection - Water

2.3.3.5.1 Summary of Technical Information in the Application

LRA Section 2.3.3.5 describes the fire protection-water system, which provides adequate fire protection capability in all areas of the plant where a fire hazard may exist. The FP-water system consists of a water supply, pumping facilities, and distribution piping and components necessary for fire suppression. Water from Lake Ontario passes through the screenwell for a reliable supply of fresh water for fire fighting. Electric motor and diesel engine-driven water pumps discharge into the yard main and an underground loop encircling the entire plant that supplies water to fixed fire suppression systems, interior hose stations, and exterior fire hydrants. Manual fire suppression is available from exterior fire hydrants surrounding the power block and from hose stations located inside power block areas. Fire suppression by at least one manually-controlled hose stream is available in all areas except the primary containment. The fixed FP systems include deluge and preaction systems with unpressurized empty pipes controlled by a heat detection system, pressurized wet pipe systems, and pressurized dry pipe systems with air in the pipes and automatic "closed" sprinkler heads. An air foam system with a timed air foam discharge cycle blankets the condenser pit as well as oil floating on any water accumulation in the pit. A manually-initiated water foam system is a backup to the HPCI pump room water spray system. Foam pickup tubes and applicator nozzles are for manual firefighting.

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

LRA Tables 2.3.3-5 and 2.3.3-14-38 identify the following FP-water system component types within the scope of license renewal and subject to AMR:

- bolting
- expansion joint
- filter housing
- flow element
- gear box housing
- heat exchanger (bonnet)
- heat exchanger (shell)
- heat exchanger (tube)
- heater housing
- muffler
- nozzle
- orifice
- piping
- pump casing
- sight glass
- strainer
- strainer housing
- tank

- tubing
- turbocharger housing
- valve body

The FP-water system component intended functions within the scope of license renewal include:

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.3.5.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.5 and 2.3.3.14, and UFSAR Section 9.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

The staff also reviewed the safety evaluation (SE) dated August 1, 1979, approving the applicant's Fire Protection Program and supplemental SE reports listed in Operating License Condition 2.C(3). The applicant's FP CLB refers to this SE and summarizes the Fire Protection Program and 10 CFR 50.48 commitments using 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. The staff then reviewed those components that the applicant indicated as within the scope of license renewal for whether the applicant had omitted any passive and long-lived components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.5 found 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 follows.

In RAI 2.3.3.5-1 dated January 12, 2007, the staff stated:

> LRA drawing LRA-FB-48A-0 shows the motor driven vertical turbine make up pump (P-3), hydropneumatic tank (TK-4), and associated components as out of scope (i.e., not colored in blue). The staff requests that the applicant verify whether the motor driven vertical turbine make up pump, hydropneumatic tank, and associated components are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification

for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> The motor driven jockey fire pump (76-P-3) maintains fire system pressure during standby operations. As shown at coordinate C-3 on drawing LRA-FB-48A, this component is outside the quality class ‘M’ (augmented quality) boundary that defines components required for 10 CFR 50.48 at JAFNPP. However, the pump and its associated components support standby operation of the fire water system and are being included in the scope of license renewal and subject to aging management review. No changes are required to Table 2.3.3-5 to include these components. Because the component types of pump casing, piping, valve body, and sight glass exposed to raw water are already included in Table 3.3.2-5 and credit the Fire Water System Program as the aging management program, a change to Table 3.3.2-5 for these component types is not required. For the hydro pneumatic tank, the following aging management review results are added to Table 3.3.2-5.

Component type	Tank
Intended function	Pressure boundary
Material	Carbon steel
Environment	Raw water
Aging Effect Requiring Management	Loss of material
Aging Management Program	Fire Water System
NUREG 1801 Vol. 2 Item	VII.G-24 (A-33)
Table 1 Item	3.3.1-68
Notes	B

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-1 acceptable because it included the jockey pump, hydro-pneumatic tank (TK-4), and their components within the scope of license renewal and subject to an AMR. The staff concludes that the motor-driven jockey fire pump, hydro-pneumatic tank (TK-4), and their components are included correctly. The staff’s concern described in RAI 2.3.3.5-1 is resolved.

In RAI 2.3.3.5-2 dated January 12, 2007, the staff stated:

> LRA drawing LRA-FB-48A-0 shows the yard fire hydrants to be in scope (i.e., colored in blue). The LRA Table 2.3.3-5, ‘Fire Protection—Water System Components Subject to Aging Management Review,’ and Table 3.3.2-5, ‘Fire Protection—Water System Summary of Aging Management Evaluation,’ do not list yard fire hydrants for the Fire Protection—Water System. According to JAFNPP commitments to satisfy Appendix A to 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,’ August 23, 1976 JAFNPP letter dated January 11, 1977, states that: ‘*the condensate storage tanks located outdoors are protected by outside fire hydrants and associated hose houses and equipment*.’ The staff requests that the applicant verify whether the yard fire hydrants are subject to an AMR in accordance with

> 10 CFR 54.21(a)(1). If they are excluded from an AMR, the staff requests that the applicant provide justification for the exclusion and address how the aging of those hydrants will be managed for the extended period of operation to ensure providing an effective hose stream when required. Furthermore, fire hydrants are considered passive and long-lived components in accordance with 10 CFR 54.21.

In its response dated February 12, 2007, the applicant stated:

> The yard fire hydrants are subject to aging management review as shown on LRA-FB-49A and are included in the component type 'valve body' listed in Table 2.3.3-5. The corresponding line item in Table 3.3.2-5 is valve body with material gray cast iron and environment raw water (int).

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-2 acceptable because it committed to interpret yard fire hydrants as included in the "valve body," which is within the scope of license renewal and subject to an AMR. The staff is adequately assured that the applicant will consider yard fire hydrants for the fire suppression appropriately during aging management; therefore, the staff's concern described is RAI 2.3.3.5-2 is resolved.

In RAI 2.3.3.5-3, dated January 12, 2007, the staff stated:

> LRA drawing LRA-FB-48A-0 shows the sprinkler heads to be in scope (i.e., colored in blue). The LRA Table 2.3.3-5, 'Fire Protection—Water System Components Subject to Aging Management Review,' and Table 3.3.2-5, 'Fire Protection—Water System Summary of Aging Management Evaluation,' do not list sprinkler heads for the Fire Protection—Water System. The staff requests that the applicant verify whether the sprinkler heads are subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> Sprinkler heads are subject to aging management review as shown on LRA-FB-49A and are included in the component type 'nozzle' listed in Tables 2.3.3-5 and 3.3.2-5. Materials are carbon steel and copper alloy > 15% Zn.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-3 acceptable because it adequately explained that the sprinkler heads in question are subject to an AMR. Furthermore, the applicant stated that the sprinkler heads are represented in LRA Tables 2.3.3-5 and 3.3.2-5 by the component type "nozzles." Therefore, the staff's concern described in RAI 2.3.3.5-3 is resolved.

In RAI 2.3.3.5-4 dated January 12, 2007, the staff stated:

> LRA drawing LRA-FB-49A-0 shows the east diesel fire pump and Screenwell Building fire suppression system and associated components as out of scope

> (i.e., not colored in blue). The staff requests that the applicant verify whether the east diesel fire pump and Screenwell Building fire suppression system and associated components are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> The east diesel fire pump (76-P-4) is a backup to the main diesel fire pump (76-P-1) and electric fire pump (76-P-2) which supply all normal fire water loads. It is not required to comply with the requirements of 10 CFR 50.48 as described in Technical Requirements Manual (TRM) Section B 3.7.H and is therefore not in scope for license renewal. The screenwell building fire suppression system is shown on LRA-FB-49A at coordinates D1 to G1. This system is highlighted as subject to aging management review with the exception of the components on the discharge of the east diesel fire pump which is not required for 10 CFR 50.48 compliance, and its components are included in LRA Table 3.3.2-5.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-4 acceptable. The east diesel fire pump backs up the main diesel fire pump (76-P-1) and is not credited to meet BTP APCSB 9.5-1, Appendix A, which requires redundant fire water pumps with independent power supplies and controls. The applicant has redundant vertical-shaft centrifugal fire pumps for the water supply system, one electric motor-driven and the other diesel-driven; therefore, the staff finds that the applicant correctly excluded the east diesel fire pump from the scope of license renewal from an AMR. The applicant included the screenwell building fire suppression system and its components within the scope of license renewal and subject to an AMR. The staff concludes that the screenwell building fire suppression system and its components are included correctly. The staff's concern described in RAI 2.3.3.5-4 is resolved.

In RAI 2.3.3.5-5 dated January 12, 2007, the staff stated:

> Section 4.3.1.3 of the Safety Evaluation (SE) dated August 1, 1979, states that a 30 gpm automatic electric driven centrifugal jockey pump is located in the same room as the electric motor driven fire pump. The jockey pump takes suction from the intake sump to maintain about 150 psig in the fire water system yard loop. The jockey pump and its associated components appear to have fire protection intended functions required for compliance with 10 CFR 50.48 as stated in 10 CFR 54.4. The staff requests that the applicant verify whether the jockey pump and its associated components are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> The motor driven jockey fire pump (76-P-3) maintains fire system pressure

> during standby operations. As shown at coordinate C-3 on drawing LRA-FB-48A, this component is outside the quality class ‘M’ (augmented quality) boundary that defines components required for 10 CFR 50.48 at JAFNPP. However, the pump and its associated components support standby operation of the fire water system and are being included in the scope of license renewal and subject to aging management review. Because the component types of pump casing, piping, valve body, and sight glass exposed to raw water are already included in Tables 2.3.3-5 and 3.3.2-5 and credit the Fire Water System Program as the aging management program, a change to the LRA tables for these component types is not required.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-5 acceptable because it included the motor-driven jockey fire pump (76-P-3) and its components within the scope of license renewal and subject to an AMR. The staff concludes that the motor-driven jockey fire pump and its components are included correctly. The staff’s concern described in RAI 2.3.3.5-5 is resolved.

In RAI 2.3.3.5-6 dated January 12, 2007, the staff stated:

> Section 4.3.1.4 of the SE dated August 1, 1979, discusses interior hose stations in plant areas. The staff requests that the applicant to verify whether these interior hose stations and their associated components are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> The interior hose stations have intended functions that are required for 10 CFR 54.4(a)(3) and are therefore included in the scope of license renewal. These hose stations are included in the structural aging management review in the ‘Fire hose reels’ line item in LRA Tables 2.4-4 and 3.5.2-4, for bulk commodities. Piping and valve components supplying raw water to the hose reels are included in Tables 2.3.3-5 and 3.3.2-5 and credit the Fire Water System Program as the aging management program. As stated in LRA Section B.1.13.2, the fire hoses on these hose reels are periodically replaced and are therefore not subject to aging management review. This is consistent with NUREG-1800, Table 2.1-3 which classifies fire hoses as consumables.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-6 acceptable because it adequately explained that the interior hose stations in question are within the scope of license renewal and subject to an AMR. The applicant stated that LRA Tables 2.4-4 and 3.5.2-4 includes the hose stations in the structural AMR in the “Fire hose reels” line item for bulk commodities. LRA Tables 2.3.3-5 and 3.3.2-5 include piping and valve components supplying raw water to the hose reels. The staff’s assurance that the applicant will consider the interior hose stations and their components for firefighting appropriately during plant aging management is adequate; therefore, the staff’s concern described in RAI 2.3.3.5-6 is resolved.

In RAI 2.3.3.5-7 dated January 12, 2007, the staff stated:

> Section 4.3.1.5 of the SE dated August 1, 1979, discusses preaction sprinkler systems provided in the recirculation pumps motor generator set room and in the emergency diesel generator rooms. The LRA does not list preaction sprinkler systems and their associated components provided in the recirculation pumps motor generator set room and in the emergency diesel generator rooms as being in scope and subject to an AMR. The staff requests that the applicant verify whether the preaction sprinkler systems and their associated components are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> Pre-action sprinkler systems and associated components in the recirculation pumps motor generator set room (LRA-FB-49A, coordinate G-6) and emergency diesel generator rooms (LRA-FB-49A, coordinate F-2) are subject to aging management review with components included in LRA Tables 2.3.3-5 and 3.3.2-5 and highlighted on referenced LRA drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-7 acceptable because it committed to include pre-action sprinkler systems and their components installed in the recirculation pumps motor generator set and EDG rooms within the scope of license renewal and subject to an AMR. Therefore, the staff's assurance that the applicant will consider the fire water systems for fire suppression in the recirculation pumps motor generator set and EDG rooms appropriately during aging management is adequate and the staff's concern described in RAI 2.3.3.5-7 is resolved.

In RAI 2.3.3.5-8 dated January 12, 2007, the staff stated:

> Section 4.3.1.5 of the SE dated August 1, 1979, discusses manual water spray systems in the HPCI pump room and reactor core isolation coolant (RCIC) pump room; in the vicinity of the standby gas treatment (SGT) system charcoal filters, hydrogen seal oil unit, and turbine generator bearing boxes; and in the reactor feed-pump turbine area and piping area. The LRA does not list manual water spray systems provided in HPCI and RCIC pump rooms; in the vicinity of the SGT system charcoal filters, hydrogen seal oil unit, and turbine generator bearing boxes; and in the reactor feed-pump turbine area and piping area as being in scope and subject to an AMR. The staff requests that the applicant verify whether the manual water spray systems and their associated components are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> Water spray systems in the HPCI pump rooms (LRA-FB-49A, coordinate F-7), RCIC pump rooms (LRA-FB-49A, coordinate F-7), SGT system charcoal filters (LRA-FM-49A, coordinates F-7), hydrogen seal oil unit (LRA-FB-49A, coordinate E-3), turbine generator bearing boxes (LRA-FB-49A, coordinate G-5), and reactor feed pump turbine and piping area (LRA-FB-49A, coordinates D-3, F-3) are subject to aging management review with components included in LRA Tables 2.3.3-5 and 3.3.2-5 and highlighted on referenced LRA drawings.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-8 acceptable because it indicated the water spray systems in the HPCI and RCIC pump rooms, SGT system charcoal, turbine generator bearing boxes, and reactor feed pump turbine and piping area highlighted on the license renewal drawings. Therefore, the staff's assurance that the applicant will consider the water spray systems for fire suppression of the HPCI and RCIC pump rooms, SGT system charcoal, turbine generator bearing boxes, and reactor feed pump turbine and piping area appropriately during aging management is adequate and the staff's concern described in RAI 2.3.3.5-8 is resolved.

In RAI 2.3.3.5-9 dated January 12, 2007, the staff stated:

> Section 4.5 of the SE dated August 1, 1979, discusses flood drains provided in all plant areas protected with fixed water fire suppression system. The curbs/dikes are provided for liquid tanks in the diesel fire pump area, the dirty oil storage rooms, and main oil sump room to contain oil and fire water. The LRA does not list flood drains and curbs/dikes as being in scope and subject to an AMR. The staff requests that the applicant verify whether the flood drains and curbs/dikes are in the scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If they are excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> Drain system components provided for protection of equipment from fire suppression water are in scope and subject to aging management review. They are part of the radwaste and plant drains system described in Section 2.3.3.12 of the LRA. The components subject to aging management review in this system are described in LRA Tables 2.3.3-12 and 3.3.2-12. "Flood curbs" are structural commodities that are in scope and subject to aging management review and included in LRA Tables 2.4-4 and 3.5.2-4, for bulk commodities.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-9 acceptable. Although the SE addresses these floor drains as parts of the fire suppression system, they are not included in LRA Section 2.3.3.5, "Fire Protection–Water," LRA Table 2.3.3.5, "Fire Protection–Water System," or LRA Table 3.3.2-5, "Fire Protection–Water System Summary of Aging Management Evaluation." Instead, they are included in LRA Section 2.3.3.12, "Radwaste and Plant Drains," LRA Table 2.3.3-12 "Radwaste and Plant Drains Systems," and LRA Table 3.3.2-12, "Radwaste and Plant Drains Summary of Aging Management Evaluation," as within the scope of license renewal and subject to an AMR. Flood drains are listed as flood

curbs in the structural commodities and are within the scope of license renewal and subject to an AMR. The flood drains are included in LRA Tables 2.4-4 and 3.5.2-4 for bulk commodities. Because the applicant has committed to interpret these floor drains as included in the radioactive waste system within the scope of license renewal and subject to an AMR, the staff's assurance that the applicant will consider floor drains for fire suppression appropriately during plant aging management is adequate. Therefore, the staff's concern described in RAI 2.3.3.5-9 is resolved.

In RAI 2.3.3.5-10 dated January 12, 2007, the staff stated:

> Section 4.11 of the SE dated August 1, 1979, discusses the installation of fire resistance coating on exposed structural steel in the plant areas where the failure of exposed structural steel supporting fire barriers (floors, walls, and ceilings) could impair the safe-shutdown capability of the plant. These areas include the reactor building, turbine building, control building, diesel generator building, and others. The LRA does not list three-hour rated fire resistance coating for exposed structural steel as being in scope and subject to an AMR. The staff requests that the applicant verify whether the fire resistance coating for structural steel is in scope of license renewal in accordance with 10 CFR 54.4(a) and subject to an AMR in accordance with 10 CFR 54.21(a)(1). If structural fire resistance coating is excluded from the scope of license renewal and not subject to an AMR, the staff requests that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated:

> Flame retardant coatings are in scope and subject to aging management review and are included in the line item "Fire proofing" in LRA Tables 2.4-4 and 3.5.2-4, for bulk commodities.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-10 acceptable because LRA Tables 2.4-4 and 3.5.2-4 list flame retardant coatings as fire proofing in the line item in under bulk commodities as within the scope of license renewal and subject to an AMR. Therefore, the staff's assurance that the applicant will consider structural steel flame retardant coatings for FP appropriately during aging management is adequate. Therefore, the staff's concern described in RAI 2.3.3.5-10 is resolved.

In RAI 2.3.3.5-11 dated January 12, 2007, the staff stated that the applicant is required to meet BTP APCSB 9.5-1, Appendix A. According to the applicant's commitments, its letter dated January 11, 1977, states that:

> The Emergency Diesel Generator A and C combined ventilation air intake is located approximately 40 ft from the Station Reserve Transformer, T-3. This air intake is approximately 10 ft above the ground. It is not practicable to seal this opening with a 3 hr fire barrier or by a combination of opening seals and water spray.
>
> The Power Authority does not consider it necessary to provide a 3 hr fire barrier

between the ventilation opening and the transformer for the following reasons:

1) The transformer is protected by an automatic water spray deluge system in accordance with NFPA 13.

The staff asked the applicant to verify whether the automatic water deluge system for Station Reserve Transformer T-3 is within the 10 CFR 54.4(a) scope of license renewal and subject to an AMR by 10 CFR 54.21(a)(1). If excluded from the scope of license renewal and not subject to an AMR, the staff asked the applicant to justify the automatic water deluge system's exclusion.

In its response dated February 12, 2007, the applicant stated, as shown on license renewal drawing LRA-FB-49A at location E-3, the automatic water deluge system protecting Station Reserve Transformer T-3 is within the scope of license renewal, subject to an AMR, and included in LRA Tables 2.3.3.5 and 3.3.2-5.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.5-11 acceptable because it included the automatic water deluge system and its components protecting its station reserve transformer within the scope of license renewal and subject to an AMR. Therefore, the staff's concern described in RAI 2.3.3.5-11 is resolved.

2.3.3.5.3 Conclusion

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

2.3.3.6 Fire Protection - CO_2

2.3.3.6.1 Summary of Technical Information in the Application

LRA Section 2.3.3.6 describes the FP-CO_2 system, which provides FP in areas where use of a water spray or a sprinkler system is not feasible. There are fixed total flooding carbon dioxide (CO_2) suppression systems for the cable spreading room, cable run rooms, relay room, each of the two electrical bay switchgear rooms, and each of the two emergency diesel-generator switchgear rooms. Liquid CO_2 is stored in two refrigerated low-pressure tanks. A three-ton low-pressure storage tank supplies the systems in the EDG switchgear rooms and a nearby CO_2 system hose reel station in the turbine building. A ten-ton low-pressure storage tank supplies the remaining systems and two hose stations and also provides CO_2 to purge the main generator hydrogen system.

The FP-CO_2 system performs functions that support FP.

LRA Tables 2.3.3-6 and 2.3.3-14-38 identify the following FP-CO_2 system component types

within the scope of license renewal and subject to an AMR:

- bolting
- coil
- nozzle
- piping
- tank
- tubing
- valve body

The FP-CO_2 system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.6.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.6 and UFSAR Section 9.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

The staff also reviewed the SE dated August 1, 1979, approving the applicant's Fire Protection Program and supplemental SE reports listed in Operating License Condition 2.C(3). The FP CLB refers to this SE and summarizes the Fire Protection Program and 10 CFR 50.48 commitments using BTP APCSB 9.5-1 and BTP APCSB 9.5-1, Appendix A guidance. The staff then reviewed those components that the applicant included within the scope of license renewal to verify that the applicant did not omit any passive and long-lived components subject to an AMR in accordance with 10 CFR 54.21(a)(1).

The staff's review of LRA Section2.3.3.6 found 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 follows.

In RAI 2.3.3.6-1 dated January 12, 2007, the staff stated that LRA Section 2.3.3.6 describes the CO_2 fire suppression system as within the scope of the license renewal and subject to an AMR. The AMP for the CO_2 fire suppression system does not appear in LRA Section B.1.13, "Fire Protection Program." GALL AMP XI.M26, "Fire Protection," which describes CO_2 fire suppression system aging management, requires that an AMP to evaluate the periodic visual inspection and function test at least every six months for signs of system degradation. Material conditions that may affect system performance (*e.g.*, corrosion, mechanical damage, or damage to dampers) are observed during these tests. The staff asked the applicant to describe in LRA Section B.1.13 the AMP and operating experience for the CO_2 fire suppression system.

In its response dated February 12, 2007, the applicant stated that, although LRA Table 3.3.2-6

credits the Fire Protection Program for the management of CO_2 fire suppression system component aging effects, the system was omitted inadvertently from the description of the Fire Protection Program. The applicant revised the LRA Section B.1.13.1 program description to include the following sentence:

> The Fire Protection Program also includes management of the aging effects on the intended function of the CO_2 fire suppression system.

The applicant also added to LRA Section B.1.13.1 the following exception to the GALL Report :

Attributes Affected	Exception
3. Parameters Monitored/Inspected 4. Detection of Aging Effects	The functional test of the CO_2 fire suppression system is performed on a 24-month basis as listed in the current licensing basis for JAF. This frequency is sufficient to ensure system availability and operability based on station operating history and to ensure that aging effects will be properly managed through the period of extended operation.

The staff accepted the position that, in the absence of age-related degradation adversely affecting system operation and provided that visual inspections of component external surfaces are performed every six months, the periodicity specified in the CLB for functional testing of the CO_2 system is sufficient to ensure system availability and operability.

LRA Section B.1.13 already describes CO_2 fire suppression system operating experience in the following statements:

> QA audits and surveillances in 2002 and 2003 revealed that the material condition of system equipment was good and met licensing requirements. The audits and surveillances revealed no issues or findings that could impact effectiveness of the program to manage aging effects for fire protection components.
>
> In March 2005, NRC completed a triennial fire protection team inspection to assess whether the plant has implemented an adequate fire protection program and that post-fire safe shutdown capabilities have been established and are being properly maintained. Results confirmed that plant personnel were maintaining the fire protection systems in accordance with their fire protection program and identifying program deficiencies and implementing appropriate corrective actions.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-1 acceptable because it states that LRA Section B.1.13.1 omitted the CO_2 fire suppression system AMP inadvertently from the description of the Fire Protection Program. The applicant revised LRA Section B.1.13.1 to include the CO_2 fire suppression system AMP. LRA Table 3.3.2-6 includes the CO_2 fire suppression system component AMR. The staff's assurance that the applicant will consider the CO_2 fire suppression system and its components appropriately during plant aging management is adequate. Therefore, the staff's concern described in RAI 2.3.3.6-1 is resolved.

In RAI 2.3.3.6-2 dated January 12, 2007, the staff stated that LRA Tables 2.3.3-6 and 3.3.2-6 exclude several types of CO_2 fire suppression system components that appear in license renewal drawing LRA-FB-56A-0 colored purple:

- strainer
- strainer housing
- filter housing
- heater housing
- orifice
- siren body
- pipe supports
- couplings
- odorizer
- threaded connections
- pneumatic actuators

The staff asked the applicant to determine for each whether the component should be included in LRA Tables 2.3.3-6 and 3.3.2.6, and, if not, to justify the exclusion.

In its response dated February 12, 2007, the applicant stated that the pneumatic actuators are active components and therefore not subject to an AMR. Pipe supports are subject to an AMR and included in LRA Table 2.4-4 with AMR results in LRA Table 3.5.2-4 under “Component and piping supports.”

There are no strainer, strainer housing, filter housing, heater housing, siren body, or odorizer component types in the FP-CO_2 system, nor are they shown on license renewal drawing LRA-FB-56A-0. Orifice, coupling, and threaded connection component types which contain CO_2 are subject to an AMR and included in the component type "Piping" in LRA Tables 2.3.3-6 and 3.3.2.6.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-2 acceptable. Although the applicant states that it considers these components included in other line items, the LRA line item descriptions do not actually list all these components specifically. The applicant properly included the following components with the other line items within the scope of license renewal and subject to an AMR: pipe supports, orifice, coupling, and threaded connection. The staff’s assurance that the applicant will consider these components appropriately during plant aging management is adequate. The staff finds that the LRA did not include pneumatic actuators in the line item descriptions. The staff recognizes that the applicant’s interpretation of this component as active (short-lived component) will result in more vigorous oversight of its condition and performance. Because the applicant has interpreted pneumatic actuators as active, which is not within the scope of 10 CFR 50.54, the staff concludes that their exclusion from the scope of license renewal is correct and that they are not subject to an AMR. The staff finds that the following components in questions are not parts of the CO_2 system: strainer, strainer housing, filter housing, heater housing, siren body, or odorizer; therefore, the staff’s concern described in RAI 2.3.3.6-2 is resolved.

In RAI 2.3.3.6-3 dated January 12, 2007, the staff stated that, according to the applicant’s commitments to satisfy BTP APCSB 9.5-1, Appendix A, its letter dated January 11, 1977, states

that

> ... the plant computer room is located within a wire fence area inside the relay room... The relay room (including computer room) is protected by a total flooding CO_2 system with outside backup by a water hose station and portable CO_2 extinguisher.

UFSAR Section 9.8.3.11 states that, "Halon is used for fire protection in the Emergency and Plant Information Computer (EPIC) Room where it is not desirable to use a water spray or a sprinkler system." The staff asked the applicant to verify whether the flooding CO_2 fire suppression system or Halon fire suppression system in the EPIC room is within the 10 CFR 54.4(a) scope of license renewal and subject to an AMR by 10 CFR 54.21(a)(1). If the CO_2 or Halon fire suppression system is excluded from the scope of license renewal and not subject to an AMR, the staff requested justification for the exclusion.

In its response dated February 12, 2007, the applicant stated that the EPIC system is neither safety-related nor credited to support a safe-shutdown in any fire scenarios to demonstrate compliance with 10 CFR 50.48 and that, therefore, the Halon system in the EPIC room is not required to support 10 CFR 50.48 and not within the scope of license renewal nor subject to an AMR.

As stated in LRA Section 2.3.3.6 and shown in LRA Table 2.3.3-6, the total flooding CO_2 fire suppression system for the relay room is within the scope of license renewal. LRA Table 3.3.2-6 lists and license renewal drawing LRA-FB-56A shows AMR results for components in this system portion.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.6-3 acceptable. The staff finds that the EPIC system is not safety-related, cannot affect safety-related equipment by spatial interaction, is not required for safe-shutdown, and, therefore, has no 10 CFR 54.4(a)(2) intended function and that the applicant correctly excluded the Halon system in the EPIC room from the scope of license renewal and from any AMR. The total flooding CO_2 fire suppression system for the relay room is within the scope of license renewal and subject to an AMR. LRA Table 3.3.2-6 lists and license renewal drawing LRA-FB-56A shows AMR results for the components in this system portion. Therefore, the staff's concern described in RAI 2.3.3.6-3 is resolved.

2.3.3.6.3 Conclusion

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

2.3.3.7 Heating, Ventilation, and Air Conditioning

2.3.3.7.1 Summary of Technical Information in the Application

LRA Section 2.3.3.7 describes the heating, ventilation, and air conditioning (HVAC) system, which controls the station air temperatures and the flow of airborne radioactive contaminants to ensure the operability of station equipment and the accessibility and habitability of station buildings and compartments. The HVAC systems include numerous systems which together comprise plant HVAC equipment, including:

- reactor building ventilation
- turbine building ventilation
- drywell ventilation and cooling
- radwaste building ventilation
- control room and relay room ventilation and cooling
- administration building ventilation and cooling
- screenwell and water treatment ventilation system
- EDG building HVAC
- ventilation radiation monitoring subsystem of process radiation monitor system
- security building ventilation

The reactor building ventilation system controls ambient temperatures, humidity, and the flow of potentially airborne radioactive contaminants for operability of equipment and accessibility and habitability of plant buildings and compartments. The turbine building ventilation system controls plant ambient temperature, humidity, and the flow of potentially airborne radioactive contaminants. The turbine building ventilation system supplies filtered and tempered outdoor air to the operating floor and all other areas below the operating floor. The drywell ventilation and cooling system circulates cooled nitrogen around the drywell, including areas around the reactor recirculation pumps and motors, the control rod drive area, and the annular space between the reactor vessel and the primary shield. The radwaste building ventilation system removes heat rejected from operating equipment compartments to maintain required space temperatures. The control and relay rooms ventilation and cooling system provides adequate ventilation, heating, cooling, and relative humidity for those rooms. The control and relay room air conditioning systems operate independently of other plant HVAC services. These systems must operate at all times during normal, shutdown, and DBA conditions. The administration building ventilation and cooling system provides adequate ventilation, heating, cooling, and relative humidity for areas within the administration building. This system includes the administration building ventilation and cooling, administration and support building ventilation and cooling, warehouse building ventilation and cooling, station battery room ventilation and cooling, SW for admin building cooling, and technical support center/EPIC room ventilation. The screenwell and water treatment ventilation system provides ventilation and heating within the screenwell / water treatment building. The EDG building HVAC conditioning system heats and ventilates the EDG rooms and EDG switchgear rooms. The process radiation monitor system, which monitors process liquid and gas lines that may serve as discharge routes for radioactive materials, consists of a number of radiation monitors and monitoring subsystems with automatic actions and control room indications. The security access building houses a propane-powered generator for backup power to selected security loads and yard lighting. For engine cooling, the building is equipped with air intake louvers and discharge ducts with air movement produced by the engine fan.

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

LRA Tables 2.3.3-7, 2.3.3-14-11, 2.3.3-14-32, 2.3.3-14-33, 2.3.3-14-34, 2.3.3-14-35, and 2.3.3-14-36 identify the following HVAC system component types within the scope of license renewal and subject to AMR:

- bolting
- compressor housing
- damper housing
- duct
- duct flexible connection
- fan housing
- filter housing
- flow element
- heat exchanger (bonnet)
- heat exchanger (fins)
- heat exchanger (housing)
- heat exchanger (shell)
- heat exchanger (tubes)
- heat exchanger (tubesheet)
- louver housing
- orifice
- piping
- pump casing
- sight glass
- strainer
- strainer housing
- tank
- tubing
- valve body

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

- flow control
- filtration
- heat transfer
- pressure boundary

2.3.3.7.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.7 and 2.3.3.14, and UFSAR Sections 9.9.3.3, 9.9.3.4, 5.2.3.7, 9.9.3.5, 9.9.3.11, 9.9.3.6, 9.9.3.10, 9.9.3.7, 9.9.3.9, and 7.12 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

During its review, the staff evaluated the system functions described in the LRA and UFSAR to

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

2.3.3.7.3 Conclusion

The staff reviewed the LRA 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 HVAC system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.8 Containment Purge, Containment Atmosphere Dilution, and Post-Accident Sampling

2.3.3.8.1 Summary of Technical Information in the Application

LRA Section 2.3.3.8 describes the containment purge (CP), containment atmosphere dilution (CAD), and post-accident sampling system (PASS), which includes the primary containment atmosphere control and dilution system, drywell purge ventilation supply and exhaust systems, venting and vacuum relief system, and PASS. The system establishes and maintains the desired atmosphere in the primary containment, provides the means to control the relative oxygen concentration by inerting the containment atmosphere with nitrogen or deinerting it with outside air, monitors containment hydrogen and oxygen concentrations, and controls primary containment pressure and differential pressure via makeup to or venting from the drywell and suppression chamber. The system also provides nitrogen to pneumatically-operated I&C in the containment and a meas to collect and analyze liquid and gaseous samples from containment following a LOCA.

The containment atmosphere is monitored via redundant dual-range hydrogen and oxygen analyzers sampling at four separate locations, three in the drywell and one in the torus. The sample lines are redundant to each analyzer. The primary containment is deinerted by fresh outside air from a vent and purge supply fan. During both inerting and deinerting processes, the SGT system processes gas purged from the torus and drywell before exhausting it to the atmosphere. Nitrogen makeup maintains drywell pressure, drywell-to-torus differential pressure, and primary containment oxygen concentration within required limits. Instrumentation and pneumatically-operated valves in the primary containment are supplied with nitrogen gas instead of air to prevent a buildup of oxygen in the containment. Containment isolation valves outside the primary containment for the RBCLC water system also are supplied with nitrogen.

The PASS obtains representative liquid and gaseous samples from within the primary containment and gaseous samples from within the secondary containment for radio-chemical and chemical analyses in a LOCA. From interpretation of this data, the extent of core damage and other radiological and chemical conditions in the plant can be predicted. The basic system

consists of a liquid and gas sample station in the reactor water recirculation pump motor generator set room outside the secondary containment structure. The system is also designed to provide useful samples under conditions ranging from normal shutdown and power operation to design-basis LOCA.

The CP, CAD, and PASS has safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related CP, CAD, and PASS SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the CP, CAD, and PASS performs functions that support FP.

LRA Tables 2.3.3-8 and 2.3.3-14-15 identify the following CP, CAD and PASS component types within the scope of license renewal and subject to AMR:

- bolting
- filter housing
- flow element
- heat exchanger (coil)
- heat exchanger (tubes)
- heater housing
- orifice
- piping
- pump casing
- sample trap
- tank
- tubing
- valve body

The CP, CAD, and PASS component intended functions within the scope of license renewal include:

- heat transfer
- pressure boundary

2.3.3.8.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.8 and 2.3.3.14, and UFSAR Sections 5.2.3.6, 5.2.3.7, 5.2.3.8, 5.2.3.14, and 9.14.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

On the basis of its review the staff found that LRA Section 2.3.3.8 includes CP, CAD and PASS portions that meet 10 CFR 54.4 scoping requirements within the scope of license renewal. LRA

Table 2.3.3-8 also include CP, CAD and PASS components subject to an AMR by 10 CFR 54.4(a) and 10 CFR Part 54.21(a)(1). The staff found no omissions.

2.3.3.8.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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, containment atmosphere dilution, and post-accident sampling system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.9 Fuel Pool Cooling and Cleanup

2.3.3.9.1 Summary of Technical Information in the Application

LRA Section 2.3.3.9 describes the fuel pool cooling and cleanup (FPCC) system, which provides a criticality safe underwater storage location for spent fuel assemblies requiring shielding and cooling during storage and handling. The construction and configuration of the spent fuel racks preclude the possibility of criticality under normal and abnormal conditions. The spent fuel pool, fuel pool gates, and connected cooling system piping are arranged for a minimum level over fuel seated in the pool to shield plant personnel adequately. The FPCC system controls spent fuel storage pool temperature, maintains spent fuel storage pool water clarity, and minimizes the concentration of fission and corrosion products in the spent fuel storage pool. The FPCC system cools and purifies the spent fuel storage pool by passing the pool water through two heat exchangers, transferring heat to the reactor building closed loop cooling water system. Water purity and clarity in the spent fuel storage pool, reactor head cavity, and reactor internals storage pit are maintained by filtering and demineralizing. There is additional capability to add water to the pool through a cross-tie to the RHR system when normal makeup system is lost and pool water level is threatened due to heavy pool water inventory loss.

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

LRA Tables 2.3.3-9 and 2.3.3-14-12 identify the following FPCC system component types within the scope of license renewal and subject to AMR:

- bolting
- diffuser
- flow element
- heat exchanger (shell)
- neutron absorber
- orifice
- piping

- pump casing
- tank
- thermowell
- tubing
- valve body

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

- flow control
- neutron absorption
- pressure boundary

2.3.3.9.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.9 and 2.3.3.14, Sections 2.2 and 3.1.14 of Entergy Report No. FAF-RPT-05-AMM30, and UFSAR Sections 9.3 and 9.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Sections 2.3.3.9 and 2.3.3.14 found 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 follows.

In RAI 2.3.3.9-1 dated January 19, 2007, the staff noted that license renewal drawing LRA-FM-19A, at locations F3 and F4, shows lines W19-151-1A, 1B, and 17 from skimmer surge tanks TK-8A and TK-8B to surge tank drain valve VGW-15A as not within the scope of license renewal. The piping and components upstream from VGW-15A are labeled SEISMIC I. The staff requested additional information as to why these pipe and component sections are not within the 10 CFR 54.4(a) scope of license renewal and justification for the boundary locations.

In its response dated February 14, 2007, the applicant stated:

> The seismic I boundaries are uniquely identified on the license renewal drawings. The portions of the system required to maintain pressure boundary for the system to perform its safety functions are identified in the site component database as QA category I and identified within the system intended function boundary flags. The seismic I boundary identifies those portions of systems that are seismically qualified category I but not necessarily safety-related or QA1. The portions of the system that were included in the aging management review as shown by the highlighting on the LRA drawing include the portions of the system required to maintain the pressure boundary and ensure that functions

defined in 10CFR54.4(a)(1) or (a)(3) can be performed.

The portions of the system beyond the QA I boundary that are identified as Seismic I were included in scope as part of the 10 CFR 54.4(a)(2) review, but are not highlighted on individual LRA drawings, as described in LRA Section 2.1.2.1.3.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.9-1 acceptable because it adequately justified omission of the piping sections in question from the scope of license renewal under 10 CFR 54.4(a)(1) and 10 CFR 54.4(a)(3). The staff agrees that integrity of these piping sections is not required to maintain the pressure boundary. The applicant further explained that system portions beyond the QA I boundary shown as SEISMIC I were included within the scope of license renewal in the 10 CFR 54.4(a)(2) review. 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 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 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 Service, Instrument, and Breathing Air

2.3.3.10.1 Summary of Technical Information in the Application

LRA Section 2.3.3.10 describes the service, instrument, and breathing air system, which provides a continuous supply of oil-free compressed air directed to plant breathing air, instrumentation, and general plant services. The compressed air to the breathing, instrument, and service air subsystems is supplied by three air compressors arranged in parallel to discharge air through individual air receivers with a common discharge header feeding three instrument air dryers. This common discharge header also supplies air to the breathing air headers and the instrument air headers after passing through two air dryers installed in parallel. Each of the dryers has pre-filters and after-filters to ensure that no particulate matter enters the system. The breathing air system has a breathing air accumulator. Instrument air is available as a backup to drywell instrumentation and controls, which are normally supplied with nitrogen via the instrument air line. Nitrogen is used so any leakage will not dilute the nitrogen-inerted primary containment. The normal source of nitrogen is the primary containment atmosphere control and dilution system.

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

LRA Tables 2.3.3-10 and 2.3.3-14-25 identify the following service, instrument, and breathing air system component types within the scope of license renewal and subject to AMR:

- bolting
- piping
- quick connect
- tank
- tubing
- valve body

The service, instrument, and breathing air system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.10.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.10 and 2.3.3.14, Sections 2.2 and 3.1.28 of Entergy Report No. FAF-RPT-05-AMM30, and UFSAR Section 9.11 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Sections 2.3.3.10 and 2.3.3.14 found 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 RAIs as follows.

In RAI 2.3.3.10-1 dated January 19, 2007, the staff noted that license renewal drawing LRA-M-29A-0, at location G7, shows that the in-scope nitrogen supply for RCPB air operated valves (AOVs) 02AOV-17 and 02AOV-18 does not extend to the actuator but terminates at the downstream side of solenoid valves (SOVs) SOV-17 and SOV-18, respectively. The staff requested pursuant to 10 CFR 54.4(a) additional clarification for why the in-scope boundaries for the nitrogen supply lines to 02AOV-17 and 02AOV-18 do not extend to the actuator and justification for the boundary locations.

In its response dated February 14, 2007, the applicant stated:

> The safety-related function of 02AOV-17 and 02AOV-18, to maintain Reactor Coolant Pressure Boundary integrity, is performed with the valves closed and does not require pneumatic pressure. Since these valves vent the reactor vessel head to the drywell equipment drain sump, the valves would only be opened with the reactor shutdown and depressurized. Thus, the ability to open the valves is non-safety-related, and does not meet any scoping criteria for License Renewal. The safety-related function of the drywell pneumatic header is to supply

> pneumatic pressure to open the safety-relief valves (SRVs) when required. Normally closed 02SOV-17 and 02SOV-18 perform this safety-related function, and are therefore in scope for License Renewal under 10 CFR 54.4(a)(1) with the intended pressure boundary function. Nitrogen supply lines downstream of the SOVs are isolated from the SRV pneumatic supply, and have no intended function for License Renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.10-1 acceptable because the piping in question connecting the AOVs and the SOVs has no safety-related function. The AOVs, boundary valves to maintain RCPB integrity, during operation are passive components in the closed position. The SOVs, which maintain instrument air system boundary integrity, are also passive components during operation in the closed position. 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 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 service, instrument, and breathing air system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.11 Reactor Building Closed Loop Cooling Water

2.3.3.11.1 Summary of Technical Information in the Application

LRA Section 2.3.3.11 describes the reactor building closed loop cooling water (RBCLCW) system, which cools equipment in the reactor building during normal plant operations and provides a barrier between systems containing radioactive fluids and the non-radioactive SW system pumped directly from and to the lake. The RBCLCW system consisting of a normally independent closed loop piping arrangement is normally in operation cooling nonsafety-related loads in the reactor building and drywell. The RBCLCW system penetrates the primary containment in nine locations to provide cooling water to heat loads within the drywell. The RBCLCW system has three centrifugal pumps taking suction from the reactor building cooling water return loop for a cooling water flow. SW cools the RBCLCW heat exchangers. A surge tank on the suction side of the pumps accommodates system volume changes, maintains static pressure in the loop, detects gross leaks in the RBCLCW system, and allows for the addition of makeup water. Makeup water to the RBCLCW system from the demineralized water storage tank is supplied by a connection from the demineralized water transfer pump to the surge tank.

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

LRA Tables 2.3.3-11 and 2.3.3-14-9 identify the following RBCLCW system component types

within the scope of license renewal and subject to AMR:

- accumulator
- bolting
- filter housing
- flow element
- heat exchanger (shell)
- orifice
- piping
- pump casing
- tank
- tubing
- valve body

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

- flow control
- pressure boundary

2.3.3.11.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.11 and 2.3.3.14, Sections 2.2 and 3.1.11 of Entergy Report No. FAF-RPT-05-AMM30, and UFSAR Section 9.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Sections 2.3.3.2 and 2.3.3.14 found 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 follows.

In RAI 2.3.3.11-1 dated January 19, 2007, the staff noted that license renewal drawing LRA-M-15-B, at locations C4, C7, F4, and F7, shows four RBCLCW containment isolation valves on supply lines to the drywell. The license renewal boundary for each section of piping ends at the AOV; however, piping and components upstream from the boundary are labeled SEISMIC I. The staff requested pursuant to 10 CFR 54.4(a) additional information on why the following listed pipe and component sections are not within the scope of license renewal and justification for the boundary locations:

- license renewal drawing LRA-FM-15-B, location C4, upstream from AOV 130B through valve 23B

- license renewal drawing LRA-FM-15-B, location C7, upstream from AOV 130A through valve 23A
- license renewal drawing LRA-FM-15-B, location F4, upstream from AOV 132A through valve 20A
- license renewal drawing LRA-FM-15-B, location F7, upstream from AOV 132B through valve 20B

In its response dated February 14, 2007, the applicant stated that SEISMIC I boundaries are identified uniquely on the license renewal drawings. Final safety analysis report (FSAR)-Table 7.3-1 shows the penetration portions required to maintain pressure boundary for containment within the system intended function boundary flags. The SEISMIC I boundary identifies those systems that are seismically qualified category I but not necessarily required for containment integrity. System portions included in the AMR as shown by the highlighting on the license renewal drawing include those required to maintain the pressure boundary and ensure containment integrity.

The applicant also stated that portions of the system beyond the containment boundary shown as seismic I were included within the scope of license renewal in the 10 CFR 54.4(a)(2) review but not highlighted on individual license renewal drawings.

Based on its review, the staff finds the applicant’s response to RAI 2.3.3.11-1 acceptable because the piping sections in question are not required to maintain containment integrity and, therefore, not within the scope of license renewal for 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(3). The staff agrees that integrity of these piping sections is not required to maintain the pressure boundary; 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, accompanying scoping boundary 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 RBCLCW system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.12 Radwaste and Plant Drains

2.3.3.12.1 Summary of Technical Information in the Application

LRA Section 2.3.3.12 describes the radwaste and plant drains system, which collects, treats, and disposes of radioactive and potentially radioactive liquid and solid wastes in a controlled and safe manner. These wastes are collected in sumps and drain tanks at various locations throughout the plant and then transferred to the appropriate collection tanks in the radioactive waste building prior to treatment, storage, and disposal. Processed liquid wastes are either returned to the condensate system or discharged from the plant in a controlled manner. The

wastes are collected, treated, and disposed of according to their conductivity and radioactivity. The system is divided into several subsystems so that the liquid wastes from various sources can be segregated and processed separately. The system also drains fire suppression water flow in a fire so that water buildup will not impact safety-related equipment. Process solid wastes are collected, dewatered, packaged, and stored in shielded compartments prior to offsite shipment. The yard storm drains system collects and transfers rain runoff to the storm sewers. The floor and roof drainage system collects and removes waste liquids from their points of origin and to transfer them to suitable treatment and/or disposal areas in a controlled manner. The system includes non-radioactive floor and roof drains from all areas of the plant.

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

LRA Tables 2.3.3-12, 2.3.3-14-13 and 2.3.3-14-45 identify the following radwaste and plant drains system component system types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- flow element
- orifice
- piping
- pump casing
- sight glass
- steam trap
- strainer housing
- tank
- tubing
- valve body
- sight glass

The radwaste and plant drains system component intended function within the scope of license renewal include:

- pressure boundary
- drainage flowpath

2.3.3.12.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.12 and 2.3.3.14, Sections 2.2, 3.1.15, 3.1.44, and 3.1.46 of Entergy Report No. FAF-RPT-05-AMM30, and UFSAR Sections 9.13, 11.2, and 11.3 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review fo the BOP two-tier review process, the staff evaluated the

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

The staff's review of LRA Sections 2.3.3.12 found 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 follows.

In RAI 2.3.3.12-1 dated April 25, 2007, the staff requested additional information on the radwaste and plant drains system and on specific components required to support the 10 CFR 54.4(a)(3) function.

In its response, by letter dated May 17, 2007, the applicant stated that the plant drains system has a network of four-inch piping to remove approximately 100 gpm of fire fighting water in various plant areas and buildings and that components included within the scope of license renewal were the sump pumps, floor drain piping and valves, sump pump suction and discharge piping and valves, and tanks that supported the function.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.12-1 acceptable because it clearly indicated plant areas and radwaste and plant drains system components included within the scope of 10 CFR 54.4(a)(3). 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, RAI responses, and scoping boundary 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 radwaste and plant drains system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.13 Security Generator

2.3.3.13.1 Summary of Technical Information in the Application

LRA Section 2.3.3.13 describes the security generator system, equipment necessary for maintaining site security, including the security generator, which provides necessary lighting for certain areas.

The security generator system performs functions that support fire protection.

LRA Table 2.3.3-13 identifies the following security generator system component types within

the scope of license renewal and subject to an AMR:

- bolting
- expansion joint
- filter housing
- heat exchanger (shell)
- heat exchanger (tubes)
- piping
- pump casing
- silencer
- strainer
- strainer housing
- tank
- tubing
- valve body

The security generator system component intended functions within the scope of license renewal include:

- filtration
- heat transfer
- pressure boundary

2.3.3.13.2 Staff Evaluation

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

In conducting its Tier-2 review fo the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff reviewed components that the applicant indicated as within the scope of license renewal to verify that the applicant had not omitted any passive and long-lived components subject to an AMR by 10 CFR 54.21(a)(1). Based on its review, the staff found that, in addition to the component types listed in LRA Table 2.3.3-13, an additional component, sight glass, should have been included within the 10 CFR 54.4(a)(3) scope of license renewal. The applicant, in Amendment 11 dated May 17, 2007, has added the component type sight glass to LRA Table 2.3.3-13.

2.3.3.13.3 Conclusion

The staff reviewed the LRA and inspected the security generator 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 security generator system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14 Miscellaneous Systems In-Scope for 10 CFR 54.4(a)(2)

LRA Section 2.3.3.14 describes the miscellaneous systems within the scope of license renewal under 10 CFR 54.4(a)(2). Such systems interact with safety-related systems in one of two ways: (1) a functional failure where the failure of a nonsafety-related SSC to perform its function impacts a safety function or (2) a physical failure where a safety function is impacted by the loss of structural or mechanical integrity of an SSC in physical proximity to a safety-related component.

LRA Section 2.3.3.14 states that functional failures of nonsafety-related SSCs which could impact a safety function are identified in previous LRA sections.

LRA Table 2.3.3.14-A shows systems within the scope of license renewal with potential for physical interactions with safety-related components. Of these systems, the following are not described elsewhere in the LRA:

- reactor water cleanup
- extraction steam
- decay heat removal (DHR)
- feedwater heater vents and drains
- circulating water
- turbine building closed loop cooling (TBCLC)
- vacuum priming and air removal
- turbine lube oil
- secondary plant drains
- raw water treatment
- contaminated equipment drains
- auxiliary gas treatment
- plumbing, sanitary and lab
- city water
- auxiliary boiler and accessories
- main turbine generator
- sample system
- steam seal

2.3.3.14A Reactor Water Cleanup

2.3.3.14A.1 Summary of Technical Information

The RWCU system maintains high reactor water purity to limit chemical and corrosive action, fouling, and deposition on heat transfer surfaces. The RWCU system removes corrosion products to limit impurities for neutron activation and resultant radiation from deposition of

corrosion products. The system also decreases reactor coolant system inventory during heatup.

The failure of nonsafety-related RWCU SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the RWCU system performs functions that support fire protection.

LRA Table 2.3.3-14-6 identifies the following RWCU system component types within the scope of license renewal and subject to an AMR:

- bolting
- demineralizer
- flow element
- heat exchanger (shell)
- orifice
- piping
- pump casing
- sight glass
- strainer housing
- tank
- thermowell
- tubing
- valve body

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

2.3.3.14A.2 Staff Evaluation

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

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

After examining the IPE results to confirm that the RWCU system poses no significant risk, the staff completed a Tier-1 review, which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

2.3.3.14A.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR.

The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the miscellaneous systems in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14B Extraction Steam

2.3.3.14B.1 Summary of Technical Information

The extraction steam system transports steam to components of the steam and power conversion system. The extraction steam system supplies steam from the turbine extraction points to loads like the feedwater heaters and reactor feed pump turbines. The extraction steam system includes the moisture separator reheaters and the steam reboiler system.

The failure of nonsafety-related extraction steam SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-17 identifies the following extraction steam system component types within the scope of license renewal and subject to an AMR:

- bolting
- expansion joint
- flow element
- heat exchanger (shell)
- orifice
- piping
- strainer housing
- tank
- thermowell
- tubing
- valve body

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

2.3.3.14B.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Sections 9.18, 10.1, 10.2 and 10.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff verified that the extraction steam system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

2.3.3.14B.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the extraction steam system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14C Decay Heat Removal

2.3.3.14C.1 Summary of Technical Information

The DHR system provides an alternate means of decay heat removal from the spent fuel pool. The DHR system can also cool the reactor core when the reactor pressure vessel head has been removed, the reactor cavity flooded, and the fuel transfer gates removed by utilizing natural convection currents established between the spent fuel pool and the reactor cavity.

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

LRA Table 2.3.3-14-18 identifies the following DHR system component types within the scope of license renewal and subject to an AMR:

- bolting
- flow element
- heat exchanger (shell)
- piping
- pump casing
- strainer housing
- tubing
- valve body

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

2.3.3.14C.2 Staff Evaluation

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

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

After examining the IPE results to confirm that the DHR steam system poses no significant risk, the staff completed a Tier-1 review, which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

2.3.3.14C.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the miscellaneous systems in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14D Feedwater Heater Vents and Drains

2.3.3.14D.1 Summary of Technical Information

The feedwater heater vents and drains system supports feedwater heating in the condensate system. The system consists of the piping, valves, instruments, and controls that maintain appropriate shell side levels in the feedwater heaters. Drains cascade from the highest to lowest pressure heater and to the main condenser. Heater vents are also connected to the condenser.

The failure of nonsafety-related feedwater heater vents and drains SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-21 identifies the following feedwater heater vents and drains system component types within the scope of license renewal and subject to an AMR:

- bolting
- orifice
- piping
- sight glass
- thermowell
- tubing
- valve body

The feedwater heater vents and drains system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.14D.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 10.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff verified that the feedwater heater vents and drains system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14D.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the feedwater heater vents and drains system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14E Circulating Water

2.3.3.14E.1 Summary of Technical Information

The circulating water system supplies the main condenser continuously with cooling water to remove heat rejected by the turbine exhaust and turbine bypass steam as well as from other exhausts over the full range of operating loads.

The failure of nonsafety-related circulating water SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-22 identifies the following circulating water system component types within the scope of license renewal and subject to an AMR:

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

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

2.3.3.14E.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 10.6 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

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

The staff's review of LRA Section 2.3.3.14 found 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 follows.

In RAI 2.3.3.14-2, dated April 25, 2007, the staff requested additional information on a number of systems included in LRA Section 2.3.14, including the circulating water system. Specifically the staff asked the applicant to indicate the circulating water system parts included within the 10 CFR 54.4(a)(2) scope of license renewal.

In its response dated May 17, 2007, the applicant indicated that it had used the component database for the locations of the circulating water system components. Potential 10 CFR 54.4(a)(2) passive mechanical components in the system are located in the screenwell house and turbine building. All system components except those in the turbine building in areas below elevation 260 and on elevation 260 outside grid coordinates 260-8D through 13G and in the screenwell pump house below elevations 255 or areas on elevation 272 outside building grid coordinates SW272-25A and 26A are included within the 10 CFR 54.4(a)(2) scope of license renewal. There is no safety-related equipment in the excluded areas and, thus, no potential for spatial interaction of nonsafety-related with safety-related SSCs; therefore, the applicant's exclusion of the components in these areas is justified.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-2 acceptable because it clearly indicated the plant areas and circulating water system components included within the 10 CFR 54.4(a)(2) scope of license renewal. The staff's concern about the circulating water system described in RAI 2.3.3.14-2 is resolved.

2.3.3.14E.3 Conclusion

The staff reviewed the LRA 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

circulating water system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14F Turbine Building Closed Loop Cooling

2.3.3.14F.1 Summary of Technical Information

The TBCLC system cools auxiliary equipment in the turbine building and in the radioactive waste building. It also provides makeup seal water to the condenser air removal pumps and the condenser water box vacuum priming pumps.

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

LRA Table 2.3.3-14-23 identifies the following TBCLC system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- strainer housing
- tank
- thermowell
- tubing
- valve body

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

2.3.3.14F.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 9.6 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.14 found 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 follows.

In RAI 2.3.3.14-2 dated April 25, 2007, the staff requested additional information on a number of systems included in LRA Section 2.3.14, including the TBCLC system. Specifically the staff

asked for the TBCLC system part included within the scope of license renewal and why the TBCLC pumps and heat exchangers were not subject to an AMR.

In its response dated May 17, 2007, the applicant indicated that it had used the component database for locations of TBCLC components. Potential 10 CFR 54.4(a)(2) passive mechanical components in the system are located in the turbine building, auxiliary boiler room, and radwaste building. Components in the auxiliary boiler building, the radwaste building, and turbine building in areas below elevation 260 and on elevation 260 outside grid coordinates 260-8D through 13G are not within the scope of license renewal as there are no safety-related components in these buildings or areas. The applicant stated that the TBCLC pumps and heat exchangers in turbine building areas with a floor elevation below 260 were located in an area with no safety-related equipment or components and so excluded from the scope of license renewal.

Based on its review, the staff finds the applicant's acceptable because it clearly indicated the plant areas and components of the TBCLC system and justified the exclusion of the TBCLC pumps and heat exchangers. The staff's concern about the TBCLC system described in RAI 2.3.3.14-2 is resolved.

2.3.3.14F.3 Conclusion

The staff reviewed the LRA 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 turbine building closed loop cooling system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14G Vacuum Priming and Air Removal

2.3.3.14G.1 Summary of Technical Information

The vacuum priming and air removal system removes all air and noncondensable gases from the condenser. The system also processes turbine gland seal leakoff.

The failure of nonsafety-related vacuum priming and air removal SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-24 identifies the following vacuum priming and air removal system component types within the scope of license renewal and subject to an AMR:

- bolting
- heat exchanger (shell)
- piping
- pump casing
- sight glass

- tank
- tubing
- valve body

The vacuum priming and air removal system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.14G.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 10.4 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff verified that the vacuum priming and air removal system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14G.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the vacuum priming and air removal system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14H Turbine Lube Oil

2.3.3.14H.1 Summary of Technical Information

The turbine lube oil system provides clean lubricating oil to the lubrication oil reservoirs of the main turbine generator, the reactor feed pump turbines, and the main generator shaft hydrogen seals. The turbine lube oil system includes the main turbine oil reservoir, a turbine oil conditioner, clean, dirty, and waste oil storage tanks, and the interconnecting piping, pumps, valves, instrumentation, and controls.

The failure of nonsafety-related turbine lube oil SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-26 identifies the following turbine lube oil system component types within the scope of license renewal and subject to an AMR:

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

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

2.3.3.14H.2 Staff Evaluation

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

The staff verified that the turbine lube oil system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14H.3 Conclusion

The staff reviewed the LRA and 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 lube oil system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14I Secondary Plant Drains

2.3.3.14I.1 Summary of Technical Information

The secondary plant drains system provides a drain flowpath from steam and power conversion system components to the main condenser and includes piping, valves, instrumentation, and controls to handle drainage from various systems including MS, extraction steam, and vacuum priming and air removal systems.

The failure of nonsafety-related secondary plant drains SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-27 identifies the following secondary plant drains system component types within the scope of license renewal and subject to an AMR:

- bolting
- orifice
- piping
- strainer housing
- thermowell
- tubing
- valve body

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

2.3.3.14I.2 Staff Evaluation

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

The staff verified that the secondary plant drains system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14I.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR.

The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the secondary plant drains system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14J Raw Water Treatment

2.3.3.14J.1 Summary of Technical Information

The raw water treatment system supplies treated water suitable for plant makeup and other demineralized water requirements.

The failure of nonsafety-related raw water treatment SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-28 identifies the following raw water treatment system component types within the scope of license renewal and subject to an AMR:

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

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

2.3.3.14J.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 9.10 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff verified that the raw water treatment system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14J.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the raw water treatment system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14K Contaminated Equipment Drains

2.3.3.14K.1 Summary of Technical Information

The contaminated equipment drains system collects and transfers waste liquids to suitable treatment or disposal areas in a controlled manner. The system consists of piping and components which drain contaminated or potentially contaminated waste from equipment and floor drains to the radioactive waste system for processing.

The failure of nonsafety-related contaminated equipment drains SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-29 identifies the following contaminated equipment drains system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- sight glass
- valve body

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

2.3.3.14K.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14, UFSAR Sections 9.13, 9.14 and 11.2, and Entergy Report No. FAF-RPT-05-AMM30, Sections 2.2 and 3.1.32, using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.14 found 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 follows.

In RAI 2.3.3.14-2 dated April 25, 2007, the staff requested additional information on a number of systems in LRA Section 2.3.3.14, including the contaminated equipment drain system. Specifically the staff asked which part of the contaminated equipment drain system was within the scope of license renewal.

In its response dated May 17, 2007, the applicant indicated that it had used the component database for the locations of the contaminated equipment drain system components. Potential 10 CFR 54.4(a)(2) passive mechanical components in the system are located in the reactor building.

As the complete system is in the reactor building, where all SSCs are within the 10 CFR 54.4(a)(2) scope of license renewal, all contaminated equipment drain system components are within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-2 acceptable. The staff's concern about the contaminated equipment drain system described in RAI 2.3.3.14-2 is resolved.

2.3.3.14K.3 Conclusion

The staff reviewed the LRA 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 contaminated equipment drain system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14L Auxiliary Gas Treatment

2.3.3.14L.1 Summary of Technical Information

The auxiliary gas treatment system supports the reactor vessel head removal by processing radioactive gases that accumulate under the reactor vessel head during plant outages. During outages the system also uses portable hoses or ducts to remove radioactive gasses around contaminated equipment. A removable duct section connects the reactor vessel head to the auxiliary gas treatment system consisting of a demister, high-efficiency filters, charcoal filter, and a fan. The processed gas then is discharged to the reactor building ventilation system exhaust or to the SGT system.

The failure of nonsafety-related auxiliary gas treatment SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-31 identifies the following auxiliary gas treatment system component types within the scope of license renewal and subject to an AMR:

- bolting
- damper housing
- duct

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

2.3.3.14L.2 Staff Evaluation

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

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

After examining the IPE results to confirm that the auxiliary gas treatment system poses no significant risk, the staff completed a Tier-1 review, which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

2.3.3.14L.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the miscellaneous systems in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14M Plumbing, Sanitary, and Lab

2.3.3.14M.1 Summary of Technical Information

The plumbing, sanitary, and lab system provides drinking water supplies and disposes of sanitary wastes during normal plant operation. This system includes the domestic water storage tank, potable water pump, potable water distribution piping, the shower waste storage tank and pump, and the laboratory vacuum equipment.

The failure of nonsafety-related plumbing, sanitary, and lab SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-37 identifies the following plumbing, sanitary, and lab system component types within the scope of license renewal and subject to an AMR:

- bolting
- heat exchanger (shell)
- piping
- strainer housing
- valve body

The plumbing, sanitary, and lab system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.14M.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 9.12 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff verified that the plumbing, sanitary, and lab system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14M.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the plumbing, sanitary, and lab system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14N City Water

2.3.3.14N.1 Summary of Technical Information

The city water system distributes potable water to various locations around the plant site. The system consists of the piping and valves from the Oswego water supply to distribution systems in buildings around the site and to such others as the potable water and water treatment systems.

The failure of nonsafety-related city water SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-39 identifies the following city water system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- valve body

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

2.3.3.14N.2 Staff Evaluation

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

The staff verified that the city water steam system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14N.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the city water system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14O Auxiliary Boiler and Accessories

2.3.3.14O.1 Summary of Technical Information

The auxiliary boiler and accessories system heats the plant building spaces during planned operation by a forced-circulation hot water system for recirculation air heating and a hot water-ethylene glycol system for heating outside air introduced into ventilation systems. The plant heating system consists of two package hot water boilers, two hot water circulating

pumps, three hot water-glycol circulating pumps, two fuel oil transfer pumps, one 170,000-gallon fuel storage tank, two compression tanks, piping, valves, combustion controls, and instrumentation.

The failure of nonsafety-related auxiliary boiler and accessories SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-40 identifies the following auxiliary boiler and accessories system component types within the scope of license renewal and subject to an AMR:

- bolting
- flow element
- piping
- tubing
- valve body

The auxiliary boiler and accessories system component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.3.14O.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 9.9.3.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

The staff verified that the auxiliary boiler and accessories system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14O.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR. The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the auxiliary boiler and accessories in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14P Main Turbine Generator

2.3.3.14P.1 Summary of Technical Information

The main turbine generator system receives steam from the boiling water reactor, economically converting a portion of the thermal energy in the steam to electric energy and extracting steam for feedwater heating.

The failure of nonsafety-related main turbine generator SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-42 identifies the following main turbine generator system component types within the scope of license renewal and subject to an AMR:

- bolting
- filter housing
- heat exchanger (shell)
- piping
- pump casing
- sight glass
- strainer housing
- tank
- thermowell
- tubing
- turbine casing
- valve body

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

2.3.3.14P.2 Staff Evaluation

The staff reviewed LRA Section 2.3.3.14 and UFSAR Section 10.2 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review of the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.14 found 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 follows.

In RAI 2.3.3.14-2 dated April 25, 2007, the staff requested additional information on a number of systems in LRA Section 2.3.3.14, including the main turbine generator system. Specifically the staff asked which part of the main turbine generator system was within the scope of license renewal.

In its response dated May 17, 2007, the applicant indicated that it had used the component database for the locations of the main turbine generator system components. Potential 10 CFR 54.4(a)(2) passive mechanical components in the system are located in the turbine building, and all passive components in the system were within the 10 CFR 54.4(a)(2) scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-2 acceptable because it clarified that all main turbine generator system components are within the scope of license renewal. The staff's concern about the main turbine generator system described in RAI 2.3.3.14-2 is resolved.

2.3.3.14P.3 Conclusion

The staff reviewed the LRA 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 main turbine generator system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14Q Sample System

2.3.3.14Q.1 Summary of Technical Information

The sample system monitors the operational performance of plant equipment. Samples are taken from various streams and locations. There are two sample sinks, one in the reactor building and one in the radioactive waste building. Most samples are sent to these sinks to facilitate sampling and reduce exposure to plant personnel. Samples are taken to the laboratory for appropriate analysis. In addition, continuous automatic monitoring and alarm of undesirable conditions uses in-line detectors when necessary.

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

LRA Table 2.3.3-14-43 identifies the following sample system component types within the scope of license renewal and subject to an AMR:

- bolting
- heat exchanger (tubes)
- piping
- pump casing

- sight glass
- tubing
- valve body

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

2.3.3.14Q.2 Staff Evaluation

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

In conducting its Tier-2 review of the BOP two-tier process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.3.14 found 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 follows.

In RAI 2.3.3.14-2 dated April 25, 2007, the staff requested additional information on a number of systems in LRA Section 2.3.3.14, including the sample system. Specifically the staff asked which part of the sample system was within the scope of license renewal.

In its response dated May 17, 2007, the applicant indicated that it had used the component database for the locations of the sample system components. The applicant also indicated that the potential 10 CFR 54.4(a)(2) passive mechanical components in the system are located in the turbine building but that all system passive components were within the 10 CFR 54.4(a)(2) scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.3.3.14-2 acceptable because it clarified that all sample system components are within the scope of license renewal. The staff's concern about the sample system described in RAI 2.3.3.14-2 is resolved.

2.3.3.14Q.3 Conclusion

The staff reviewed the LRA 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 sample system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.3.14R Steam Seal

2.3.3.14R.1 Summary of Technical Information

The steam seal system prevents steam leakage out of and air leakage into the turbine or condenser. The system consists of the steam seal regulator, steam seal header, and piping to the steam packing exhauster. Steam is supplied to the steam seal system from the gland seal reboiler system. Sealing steam is supplied to the sub-atmospheric glands of the low-pressure turbine and the reactor feed pump turbine from the steam seal header. The outer ends of all glands are routed to the steam packing exhauster, which is maintained at a slight vacuum by the exhaust blowers.

The failure of nonsafety-related steam seal SSCs potentially could prevent the satisfactory accomplishment of a safety-related function.

LRA Table 2.3.3-14-44 identifies the following steam seal system component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- tubing
- valve body

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

2.3.3.14R.2 Staff Evaluation

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

The staff verified that the steam seal system poses no significant risk by examining the IPE results, and therefore, performed a Tier-1 review which does not require detailed boundary drawings. The system is not a dominant contributor to core damage frequency, nor is it involved in the dominant initiating events.

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

2.3.3.14R.3 Conclusion

The staff reviewed the LRA to determine whether the applicant failed to identify any SSCs within the scope of license renewal. The staff finds no such omissions. In addition, the staff's review determined whether the applicant failed to identify any components subject to an AMR.

The staff finds no such omissions. On the basis of its review, the staff concludes that there is reasonable assurance that the applicant has adequately identified the steam seal system components in-scope for 10 CFR 54.4(a)(2) components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

The remaining systems shown in LRA Table 2.3.3.14-A as within the scope of license renewal with potential for physical interaction with safety-related components are addressed elsewhere in other LRA sections listed here:

- 2.3.1 CRD
- 2.3.1 reactor coolant
- 2.3.2.1 RHR
- 2.3.2.2 CS
- 2.3.2.4 HPCI
- 2.3.2.5 RCIC
- 2.3.2.6 gas-handling
- 2.3.2.7 primary containment
- 2.3.3.1 SLC
- 2.3.3.2 SW
- 2.3.3.3 EDG
- 2.3.3.5 FP
- 2.3.3.7 administration building ventilation and cooling
- 2.3.3.7 drywell ventilation and cooling
- 2.3.3.7 process radiation monitors
- 2.3.3.7 reactor building ventilation
- 2.3.3.7 screenwell and water treatment ventilation and cooling
- 2.3.3.7 turbine building ventilation
- 2.3.3.8 CP, CAD, and PASS
- 2.3.3.9 FPCC
- 2.3.3.10 service, instrument, and breathing air
- 2.3.3.11 RBCLCW
- 2.3.3.12 radwaste
- 2.3.4.1 condensate
- 2.3.4.2 MS
- 2.3.4.3 feedwater

2.3.4 Steam and Power Conversion Systems

LRA Section 2.3.4 identifies the steam and power conversion systems SCs subject to an AMR for license renewal.

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

- 2.3.4.1 condensate
- 2.3.4.2 main steam
- 2.3.4.3 feedwater

The staff's findings on review of LRA Sections 2.3.4.1 – 2.3.4.3 are in SER Sections 2.3.4.1 – 2.3.4.3, respectively.

2.3.4.1 Condensate

2.3.4.1.1 Summary of Technical Information in the Application

LRA Section 2.3.4.1 describes the condensate system, which heats and supplies feedwater to the reactor. The condensate tanks supply water to the HPCI and RCIC systems. The condensate system includes main condensers, condensate pumps, condensate demineralizers, condensate booster pumps, feedwater heaters, CSTs, and condensate transfer pumps. Condensate demineralizers maintain the required purity of feedwater to the reactor by removing suspended and dissolved solids and fission, activation, and corrosion products The full-flow, deep bed condensate demineralizer system consists of eight (one spare) mixed-bed ion exchangers and an external chemical regeneration facility. The CSTs receive system reject flow and provide condensate for any continuous or intermittent batch-type services, including plant system makeup and suppression pool makeup. Two condensate transfer pumps supply condensate to various loads, for which suction connections above the HPCI and RCIC suctions to the CSTs provide a 100,000-gallon reserve in each tank for the ECCS. The lower half of each tank is below ground level for tornado and SEISMIC protection of the 100,000-gallon reserve storage capacity. The condensate tanks are the preferred supply of water to the HPCI and RCIC systems while torus water storage provides a safety-related backup water supply.

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

LRA Tables 2.3.4-1 and 2.3.3-14-19 identify the following condensate system component types within the scope of license renewal and subject to an AMR:

- bolting
- flow element
- heat exchanger (shell)
- orifice
- piping

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

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

- filtration
- pressure boundary

2.3.4.1.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.14 and 2.3.4.1 and UFSAR Sections 10.3, 10.7, 10.8, and 10.9 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review fo the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Sections 2.3.3.2 and 2.3.3.14 found 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 follows.

In RAI 2.3.4.1-1 dated January 19, 2007, the staff noted that two condensate storage tanks were the preferred source of water to the HPCI and RCIC systems during postulated small pipe breaks. Each tank must have a reserve storage capacity of 100,000 gallons and be capable of isolation from other systems. The tanks are designed for the required flow even if their portions above ground are destroyed by tornado or earthquake. License renewal drawing LRA-FM-33-D indicates the nozzle penetration at the storage tanks as the license renewal boundary for system piping other than HPCI and RCIC with a possibility of a tank leak not capable of isolation. The staff requested pursuant to 10 CFR 54.4(a) additional information on why the piping from nozzle penetrations to the nearest isolation valves is not within the scope for license renewal and justification for the boundary locations.

In its response dated February 14, 2007, the applicant stated that the schematic license renewal drawing LRA-FM-33-D does not show actual nozzle locations. The tank nozzles in question (N-2, N-3, N-11, N-7, N-9, N-8, C-3, N-5, N-10, and C-2 on tank TK-12A and N-2, N-3, N-11, N-7, N-9, N-8, C-3, N-5, N-10, and C-2 on tank TK-12B) are located in the upper half of the tank (above the required reserve supply) and their failure would not impact condensate

storage tank ability to perform the intended function. Therefore, the nozzles, valves, and piping in question are not subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.1-1 acceptable because it confirmed that failure of these components will not prevent the tanks from retaining the required minimum storage capacity of 100,000 gallons. Therefore, the staff's concern described in RAI 2.3.4.1-1 is resolved.

In RAI 2.3.4.1-2 dated January 19, 2007, the staff noted that two condensate storage tanks are the preferred sources of water to the HPCI and RCIC systems during postulated small pipe breaks. The tanks are designed for the required flow even if their portions above ground are destroyed by tornado or earthquake. License renewal drawing LRA-FM-25-A indicates the nozzle penetrations at the storage tanks as the license renewal boundaries on the crosstie line for the two tanks with the possibility of a tank leak not capable of isolation. The staff requested pursuant to 10 CFR 54.4(a) additional information on why the piping from N-1 to valve 02A on condensate storage tank A and piping from N-1 to valve 02B on condensate storage tank B are not within the scope of license renewal and justification for the boundary locations.

In its response dated February 14, 2007, the applicant stated that these nozzles (nozzle N-1 on CST A and CST B) are located well above the tank portion required to maintain the minimum volume for supply to the HPCI and RCIC pumps. Therefore, pressure boundary integrity of these lines is not required and they are not subject to an AMR.

Based on its review, the staff finds the applicant's response to RAI 2.3.4.1-2 acceptable because it confirmed that failure of these components will not prevent the tanks from retaining the required minimum storage capacity of 100,000 gallons. Therefore, the staff's concern described in RAI 2.3.4.1-2 is resolved.

2.3.4.1.3 Conclusion

The staff reviewed the LRA, scoping boundary drawings, the response to the requested inspection item, 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 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

2.3.4.2.1 Summary of Technical Information in the Application

LRA Section 2.3.4.2 describes the MS system, which carries steam from the reactor vessel through the primary containment to the MS turbine and supplies steam to the HPCI and RCIC turbines when required. The MS leak collection system collects and processes leakage across the seats of the MS isolation valves and stem packing leakage from the MS isolation valves outside containment following a design-basis LOCA. The MS leak collection system monitors

and routes the non-condensables of the packing gland leak-off of outboard MS isolation valves to the SGT system, which processes effluent of the MS leak collection system and exhausts it through the stack.

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

The MS system component types within the scope of license renewal and subject to an AMR are included in LRA Sections 2.3.3.10, 2.3.2.6, 2.3.1, and 2.3.3.14. LRA Table 2.3.3-14-16 identifies the following MS system nonsafety-related component types within the scope of license renewal and subject to an AMR:

- bolting
- piping
- strainer housing
- thermowell
- tubing
- valve body

The MS system nonsafety-related component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.4.2.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.14 and 2.3.4.2 and UFSAR Sections 4.6, 4.11, 6.4.1, 9.19, and 10.5 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review for the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.4.2.2 found 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 follows.

In RAI 2.3.4-1 dated April 25, 2007, the staff requested additional information on the scoping and screening of the MS and the feedwater systems. LRA Section 2.3.4.2.2 does not indicate clearly the specific MS components within the scope of license renewal but indicates that system components were included in the scoping of systems addressed in other LRA sections. The staff asked which MS components were within the scope of license renewal and where in the LRA they were evaluated.

In its response dated May 17, 2007, the applicant indicated the MS components within the scope of license renewal, the class 1 MS components evaluated with the RCS, the MSLCS components with the SGT system, and the MSIV accumulators with the instrument air system. The applicant also indicated that all of the system components inside the primary containment, reactor building, and turbine building except for areas below elevation 260 or on elevation 260 outside coordinates 260-8D through13G were within the 10 CFR 54.4(a)(2) scope of license renewal. Components in turbine building areas below elevation 260 or on elevation 260 outside coordinates 260-8D through13G were excluded because there are no safety-related components.

Based on its review, the staff finds the applicant's response to RAI 2.3.4-1 acceptable because it specified the MS system portions within the 10 CFR 54.4(a)(2) scope of license renewal and adequately justified the excluded components. The staff's concern described in RAI 2.3.4-1 is resolved.

2.3.4.2.3 Conclusion

The staff reviewed the LRA, the response to the requested inspection item, and scoping boundary 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 MS system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.3.4.3 Feedwater

2.3.4.3.1 Summary of Technical Information in the Application

LRA Section 2.3.4.3 describes the feedwater system, which heats and supplies feedwater to the reactor. The feedwater system includes the zinc injection system, which through addition of small amounts of ionic zinc reduces hot spots and post-shutdown radiation levels in the reactor coolant system due to reduced cobalt activation. The system consists of skid-mounted injection equipment connected to the reactor feedwater pump piping by a bypass recirculation loop around the feedwater pumps.

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

The feedwater system component types within the scope of license renewal and subject to an AMR are included in LRA Sections 2.3.1 and 2.3.3.14. LRA Table 2.3.3-14-20 identifies the following feedwater system nonsafety-related component types within the scope of license renewal and subject to an AMR:

- bolting
- orifice

- piping
- thermowell
- tubing
- valve body

The feedwater system nonsafety-related component intended function within the scope of license renewal is to provide a pressure boundary.

2.3.4.3.2 Staff Evaluation

The staff reviewed LRA Sections 2.3.3.14 and 2.3.4.3 and UFSAR Sections 9.21 and 10.8 using the evaluation methodology described in SER Section 2.3 and the guidance in SRP-LR Section 2.3.

In conducting its Tier-2 review fo the BOP two-tier review process, the staff evaluated the system functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.3.4.2.2 found an area in which additional information was necessary to complete the review of the applicant's scoping and screening results. The applicant responded to staff's RAI as follows.

In RAI 2.3.4-1 dated April 25, 2007, the staff requested additional information on the scoping and screening of the MS and the feedwater systems. LRA Section 2.3.4.2.2 does not indicate clearly the specific MS components within the scope of license renewal but indicates that system components were included in the scoping of systems addressed in other LRA sections. The staff asked which MS components were within the scope of license renewal and where in the LRA they were evaluated.

In its response dated May 17, 2007, the applicant explained that indicated the feedwater system components within the 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(3) scope of license renewal are shown on license renewal drawing LRA-FM-34A, and prefixed with "34" or "FWS," designations for the feedwater system. The applicant indicated that the components highlighted were evaluated in the RCS section. The applicant also indicated that the system components in the turbine building, except for areas below elevation 260 or on elevation 260 outside coordinates 260-8D through13G, were within the 10 CFR 54.4(a)(2) scope of license renewal. Components in turbine building areas below elevation 260 or on elevation 260 outside coordinates 260-8D through13G were excluded because there are no safety-related components in these areas.

Based on its review, the staff finds the applicants response to RAI 2.3.4-1 acceptable because it specified the feedwater system portions within the 10 CFR 54.4(a)(2) scope of license renewal and adequately justified the excluded components. The staff's concern described in RAI 2.3.4-1 is resolved.

2.3.4.3.3 Conclusion

The staff reviewed the LRA, the response to the requested inspection item, and scoping boundary 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 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:

- reactor building and primary containment
- water control structures
- turbine building complex and yard structures
- bulk commodities

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

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

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

After its review of the scoping results, the staff evaluated the applicant's screening results. For those SCs with intended functions, the staff sought to determine whether (1) the functions are performed with moving parts or a change in configuration or properties or (2) the SCs are subject to replacement after a qualified life or specified time period, as described in 10 CFR 54.21(a)(1). For those meeting neither of these criteria, the staff sought to confirm that

these SCs were subject to an AMR, as required by 10 CFR 54.21(a)(1). The staff requested additional information to resolve any omissions or discrepancies identified.

2.4.1 Reactor Building and Primary Containment

2.4.1.1 Summary of Technical Information in the Application

LRA Section 2.4.1 describes the reactor building and primary containment. The reactor building totally encloses the primary containment, the refueling and reactor servicing areas, the new and spent fuel storage facilities, and other reactor auxiliary systems. It serves as a containment during reactor refueling and maintenance operations when the primary containment is open and as an additional barrier when the primary containment is functional.

The reactor building structure is SEISMIC Class I, constructed of monolithic reinforced concrete floors and walls to the refueling level. A reinforced concrete mat placed in an excavation cut out of bedrock supports the reactor building structure and prevents settlement. The reactor building structural steel includes floor framing for platforms inside the drywell and suppression chamber.

The primary containment limits the release of fission products in a postulated DBA so that offsite doses do not exceed 10 CFR Part 100 guideline values. The primary containment is a Mark I low-leakage pressure suppression containment housing the reactor vessel, the reactor recirculation loops, and other branch connections of the reactor coolant system. Major components of primary containment include a drywell, a pressure suppression chamber, and the connecting vent system between the drywell and torus. The drywell surrounds the reactor vessel, connects to the reactor building along its lower portion, and is laterally supported by the building along its upper portion. The primary containment consists of the drywell, torus, inner refueling bellows, and primary shield wall.

The drywell is a carbon steel structure enclosed in reinforced concrete for shielding. It houses the reactor vessel and its components. The torus is a carbon steel pressure vessel anchored to and supported by the reinforced concrete foundation slab of the reactor building. The inner refueling bellows seal between the reactor vessel flange and the surrounding drywell permits flooding of the space above the vessel during refueling. The refueling bellows consists of a stainless steel bellows, backing plates, a spring seal, and removable guard rings. The primary shield wall is a high-density concrete cylinder surrounding the vessel to attenuate neutron and gamma radiation from the reactor, to allow access and maintenance of the drywell, and to limit damage from radiation exposure to area components.

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

LRA Table 2.4-1 identifies the following reactor building and primary containment component types within the scope of license renewal and subject to an AMR:

- steel
- other metals
- concrete

The reactor building and primary containment component intended functions within the scope of license renewal include:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- heat sink during SBO or DBA
- missile barrier
- pressure boundary
- structural or functional support to nonsafety-related equipment whose failure could impact safety-related equipment
- structural or functional support for safety-related equipment

2.4.1.2 Staff Evaluation

The staff reviewed LRA Section 2.4.1 and UFSAR Sections 5.1.2, 5.1.3, 5.2, 5.3, 12.3.1, and 12.4.5. 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 UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

The staff's review of LRA Section 2.4.1 found areas in which additional information was necessary to complete the evaluation of the applicant's scoping and screening results. The applicant responded to the staff's RAIs as follows.

LRA Section 2.4-1, "Reactor Building and Primary Containment," under Inner Refueling Bellows and Bulkhead Assembly does not state the makeup of the bulkhead assembly clearly. In RAI 2.4.1-1 dated November 29, 2006, the staff requested a list of bulkhead assembly components within the scope of license renewal and a drawing of the bulkhead assembly.

In its response dated December 28, 2006, the applicant stated that bulkhead assembly components are not within the scope of license renewal. They are nonsafety-related and not

required to demonstrate compliance with 10 CFR 54.4(a)(3). The applicant indicated that LRA Table 3.5.2-1, page 3.5-58 line item “inner refueling bellows” and the corresponding LRA Table 2.4-1, page 2.4-20 line item were included inadvertently. The cited GALL Report line item (C-20) is for bellows for vent pipe downcomer parts of the primary containment pressure boundary. The inner refueling bellows is not a containment pressure boundary component. Failure of these bellows or the assembly will not prevent satisfactory accomplishment of a safety function. Leakage, if any, through the bellows is directed to a drain system in the lower drywell, and thus will stay in the drywell.

Based on its review, the staff finds the applicant’s response to RAI 2.4.1-1 acceptable. The staff’s concern described in RAI 2.4.1-1 is resolved.

LRA Table 2.4-1 does not include drywell head closure bolts and double-gasketed drywell heads. These components have the intended function of the drywell pressure boundary. In RAI 2.4.1-2 dated November 29, 2006, the staff requested justification for their exclusion from the scope of license renewal.

In its response dated December 28, 2006, the applicant stated that the drywell head closure bolts are included in item ASME Classes 1, 2, 3 and MC supports bolting in LRA Table 2.4-4. The drywell head gasket is within the scope of license renewal but replaced every time the head is removed on a specified frequency and, therefore, not subject to an AMR.

Based on its review, the staff found the applicant’s response unacceptable and requested a clear description of the bolts in Table 2.4-4 because they have the important function to maintain the drywell pressure boundary.

In a supplemental response dated April 24, 2007, the applicant included the drywell head closure bolts in LRA Table 2.4-1, revised the LRA Table 2.4-1, page 2.4-19, item, “Drywell head manway cover,” to read “Drywell head manway cover and drywell head closure bolts,” and revised the LRA Table 3.5.2-1, page 3.5-56 item, “Drywell head manway cover,” to read “Drywell head manway cover and drywell head closure bolts.”

Based on its review, the staff finds the applicant’s response to RAI 2.4.1-2 acceptable. The staff’s concern described in RAI 2.4.1-2 is resolved.

In RAI 2.4.1-3 dated November 29, 2006, the staff stated that LRA Table 2.4-1 does not show refueling cavity seal components within the scope of license renewal. Proposed license renewal interim staff guidance LR-ISG-2006-01, “Plant Specific Aging Management Program for inaccessible Areas of Boiling Water Reactor Mark 1 Steel Containment Drywell Shell,” published in the *Federal Register* on May 9, 2006, states that the most likely cause of corrosion of the drywell shell in the sand-pocket areas (near the bottom of the drywell) and in the spherical portion of the drywell at higher elevations is water in the gap between the drywell and the concrete shield. The water source was leakage through the seal between the drywell and the refueling cavity and through the cracked stainless steel liner of the refueling cavity wall. Therefore, the staff asked the applicant to include all the refueling cavity seal components within the scope of license renewal and to provide a drawing that depicts the refueling cavity seal components.

In its response dated December 28, 2006, the applicant stated that the proposed license renewal interim staff guidance LR-ISG-2006-01 states that, if moisture is detected or suspected in the inaccessible area on the exterior of the drywell shell, any component source of moisture (*e.g.*, the refueling seal) should be included within the scope of license renewal subject to an AMR. There has been no detected leakage causing moisture in the vicinity of the sand cushion and none has been detected or suspected on the inaccessible areas of the drywell shell. Therefore, consistent with the interim staff guidance, the refueling seal is not subject to an AMR.

The applicant's letter attached drawings depicting the refueling cavity seal components.

By letter dated April 2, 2007, the staff requested the applicant's response to the following specific questions:

(1) Is the refueling drain/seal pipe obstruction-free?

(2) What maintenance activities or administrative procedures are in place for the drain in the trough area?

(3) What is the condition of the stainless steel liner of the refueling cavity walls ?

In its response dated April 24, 2007, the applicant stated that the outer refueling bellows drains prevent refueling cavity leakage from entering the annulus air gap above the sand cushion. The outer refueling bellows drain lines were inspected prior to start-up from the 1988 refuel outage. Five of the six refueling bellows leakage drain lines inspected through inspection ports were found to contain minor accumulation of debris including pieces of weld rod, indicating that it had been introduced during construction. The amount of debris did not affect the ability of the drain lines to perform their function. The applicant vacuumed and reinspected the lines and determined them to be clear and functional as designed. An inspection port could not be installed in the sixth line because of the piping configuration and the limited space available for access.

The applicant explained that the bellows assembly seals the trough area where the drain lines originate, preventing ingress of debris that could obstruct the lines. The only access to the area for the 1988 inspections was through the drain lines with a boroscope. This design and the redundancy in the number of drain lines make periodic inspections for whether the refueling bellows drain piping is free of obstructions unwarranted. Leakage through the outer refueling bellows, if any, flows into a common drain line with a flow indicator/switch that signals alarm in the control room in any event of bellows leakage. A functional test of the flow switch 19FIS-62 prior to every refueling outage (two-year frequency) verifies indicator/switch and control room annunciator functions. The applicant stated that there have been no failures of this test.

The applicant also stated that there has been no indication of refueling cavity steel liner leakage, which would enter the trough area below the refueling bellows assembly and from there flow into the drain system equipped with the flow alarm. There has been no actuation of the flow alarm during refueling outages.

The applicant explained that leakage exceeding the capacity of the six drain lines (four 4-inch drain lines and two 2-inch drain lines) would enter the annulus air gap and be detected flowing

from three of the four annulus air gap drains in the torus room. The applicant examined the air gaps through the drain lines using fiber optic cables in 1988 and recently in April 2007 and has detected to date no evidence of moisture that could corrode the drywell shell. In the future, if it detects any evidence of moisture, the applicant will determine additional inspection activities as appropriate. Although no formal inspection or maintenance procedure is required for the refueling cavity liner, routine observation during refueling operations and monitoring of the refueling bellows drain system and alarm have detected no liner leakage.

Based on its review, the staff finds the applicant’s response to RAI 2.4.1-3 acceptable because there have been no problems with the (1) refueling drain/seal, (2) refueling bellows, or (3) refueling pool liner. Moreover, the flow indicator switch alerts the applicant of any drain malfunction. The staff’s concern described in RAI 2.4.1-3 is resolved.

In RAI 2.4.1-4 dated November 29, 2006, the staff stated that LRA Table 2.4-1 does not include the metal drywell sump screens that functionally support safety-related equipment. The staff requested justification for their exclusion from the scope of license renewal.

In its response dated December 28, 2006, as supplemented April 24, 2007, the applicant provided additional information and stated that the drywell sumps have no screens.

Based on the staff’s review, the staff finds the applicant’s response acceptable. The staff’s concern described in RAI 2.4.1-4 is resolved.

In RAI 2.4.1-5 dated November 29, 2006, the staff stated that LRA Table 2.4-1 does not include the reinforced concrete shield plugs that shield the top of the drywell. Exclusion of the reinforced concrete shield plugs from the scope of license renewal may lead to long-term unmanaged degradation of the plugs (*e.g.*, full sectional concrete cracking, rebar corrosion, loss of bond, partial spalling or cracking of concrete due to handling, loss of load-carrying capacity of plug attachments) with a SEISMIC II/I implication potentially affecting the structural integrity of the drywell head. The staff requested justification for their exclusion from the scope of license renewal.

In its response dated December 28, 2006, the applicant stated that the reinforced shield plugs that shield the top of the drywell are in LRA Table 2.4-4, “Bulk Commodities,” under the line item “Manways, hatches, and hatch covers.”

The applicant’s response was not acceptable to the staff. In a letter dated April 2, 2007, the staff asked the applicant to list reinforced shield plugs separately from manways and hatches in LRA Table 2.4-4.

In its response dated April 24, 2007, the applicant added concrete shield plugs as a separate line item on LRA Table 2.4-1 under the component “concrete.”

Accordingly, LRA Table 3.5.2-1 was revised to add the new line item with the material grouping “concrete.”

Based on its review, the staff finds the applicant’s response to RAI 2.4.1-5 acceptable. The staff’s concern described in RAI 2.4.1-5 are resolved.

In RAI 2.4.1-6 dated November 29, 2006, the staff stated that LRA Table 2.4-1 does not show spent fuel rack neutron-absorbing material within the scope of license renewal. Long-term unmanaged degradation of the component may reduce the margin of nuclear sub-criticality in the fuel pool excessively. The staff requested justification for this exclusion from the scope of license renewal.

In its response dated December 28, 2006, the applicant stated that the spent fuel rack neutron-absorbing material is within the scope of license renewal, addressed in LRA Section 2.3.3.9, and listed in LRA Table 2.3.3-9 with AMR results in LRA Table 3.3.2-9.

Based on its review, the staff finds the applicant's response to RAI 2.4.1-6 acceptable. The staff's concern described in RAI 2.4.1-6 is resolved.

2.4.1.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 building and primary containment components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.2 Water Control Structures

2.4.2.1 Summary of Technical Information in the Application

LRA Section 2.4.2 describes the water control structures, which include the intake structure, the intake tunnel, the screenwell-pumphouse structure, and the discharge tunnel. The intake structure protects the inlet of the circulating water intake tunnel for a clear flow path for cooling water into the tunnel. The reinforced concrete intake structure sits on the lake bottom approximately 900 feet from the shoreline. Post-tensioned tendons anchor the main structure to the natural bedrock below the lake bottom. A fan-shaped intake constructed of precast concrete sections on the shoreward side of the main structure is anchored to the bedrock with grouted rock bolts. Bar racks at the intake area prevent entrance of large debris. The circulating water intake tunnel is the flow path for cooling water from the intake structure to the screenwell-pumphouse structure housing the condenser circulating water pumps, normal service water pumps, emergency service water pumps, residual heat removal service water pumps, fire protection system supply pumps, and water treatment tanks and equipment. The circulating water discharge tunnel is the return flowpath of cooling water from the screenwell-pumphouse to the lake. The failure of this SEISMIC Class II structure could impact the proper operation of the emergency service water system.

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

LRA Table 2.4-2 identifies the following water control structure component types within the scope of license renewal and subject to an AMR:

- steel
- other metals
- concrete

The water control structure component intended functions within the scope of license renewal include:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- heat sink during SBO or DBA
- missile barrier
- structural or functional support to nonsafety-related equipment the failure of which could impact safety-related equipment
- structural or functional support for fire protection, EQ, PTS, ATWS, or SBO
- structural or functional support for safety-related equipment

2.4.2.2 Staff Evaluation

The staff reviewed LRA Section 2.4.2 and UFSAR Sections 12.2.2, 12.3.6, and 12.3.7 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

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

The staff's review of LRA Section 2.4.2 found 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 follows.

In RAI 2.4.2-1 dated November 29, 2006, the staff noted that LRA Section 2.4-2 under "Discharge Tunnel" states that "failure of this Class II structure could impact the proper operation of the emergency service water system." The staff requested additional information about the potential consequences of a screenwell-pumphouse (Class II structure) failure. Specifically, the staff asked the applicant what appropriate measures it had taken to prevent failure of this structure with adverse effects on the proper operation of the emergency SW system.

In its response dated December 28, 2006, the applicant stated that the AMR produced appropriate measures for managing the effects of aging to prevent failure of this structure with adverse effects on the proper operation of the emergency SW system. SW discharge flow is routed to the lake via the discharge tunnel. Failure of the discharge tunnel could restrict the normal SW discharge to the lake. Aging management of the screenwell-pumphouse and the discharge tunnel is part of the Structures Monitoring Program as specified in LRA Table 3.5.2-2.

Based on its review, the staff finds the applicant's response to RAI 2.4.2-1 acceptable because it included in the Structural Monitoring Program aging management of the screenwell-pump house and the discharge tunnel to prevent failure of these structures. The staff's concern described in RAI 2.4.2-1 is resolved.

In RAI 2.4.2-2 dated November 29, 2006, the staff noted that LRA Table 2.4-2 does not include intake structure anchors and post-tensioned tendons that anchor the main structure to the natural bedrock below the lake bottom. The staff requested justification for the exclusion of these components from the scope of license renewal and a summary of operating experience with settlement of the intake structure.

In its response dated December 28, 2006, the applicant stated that the anchorage system for the intake structure is by post-tensioned rock bolts within the scope of license renewal under anchorages/embedments in LRA Section 2.4.4. The applicant also stated that operating experience included no settlement of the intake structure or degradation of the rock anchor system (Reference JAF-RPT-05-LRD05).

Based on its review, the staff finds the applicant's response to RAI 2.4.2-2 acceptable because it stated that the post-tension bolts are in the AMP and that in operating experience there has been no intake structure settlement or rock anchor system degradation. The staff's concern described in RAI 2.4.2-2 is resolved.

In RAI 2.4.2-3 dated November 29, 2006, the staff stated that LRA Table 2.4-2 lists "Beams, columns, floor slabs, and walls" as a component and "Exterior walls" as another. The asked that the applicant clarify by listing all structural members under each component.

In its response dated December 28, 2006, the applicant stated that, "Beams, columns, floor slabs and walls," are defined as substructure or superstructure concrete parts of the primary structural support function of a building or structure (*e.g.*, structural columns, support girders, and beams) and "exterior walls" as walls that form the perimeter base of a structure with their primary surface or both surfaces exposed to an outdoor or soil environment (*i.e.*, exposed to weather).

Based on its review, the staff finds the applicant's response to RAI 2.4.2-3 acceptable because it adequately clarified the component groups. The staff's concern described in RAI 2.4.2-3 is resolved.

2.4.2.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 water control structures components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.3 Turbine Building Complex and Yard Structures

2.4.3.1 Summary of Technical Information in the Application

LRA Section 2.4.3 describes the turbine building complex and yard structures:

- administration and control room building
- CST foundation and retaining wall
- electric bay
- EDG building
- main stack
- manholes and duct banks
- nitrogen building
- radioactive waste building
- security building
- SGT building
- transformer/switchyard support structures
- transmission tower and foundation
- turbine building including feedwater heater bay

The administration and control room building housing the offices and work areas of the plant operating personnel is situated between the reactor building and turbine building. This structure consists of the control room for operating all facilities of the plant, the relay room, cable spreading room, battery rooms, and control and relay room HVAC room.

The CST foundation and retaining wall support and protect the CSTs and their equipment. The two CSTs rest on reinforced concrete foundations. The lower half of each stainless steel tank is below ground level for tornado and SEISMIC protection from collapse of the surrounding soil by a circular, reinforced concrete retaining wall. A reinforced concrete shield wall borders the CST area to the north, west, and south of the tanks, shielding and protecting personnel protection from radiation.

The electric bay housing various motor-generator sets and both 4160 V and 600 V switchgear is part of the turbine building. The east and west cable tunnels under the electric bays separate routing for redundant electrical and control services. The electric bays and cable tunnels are SEISMIC Class I reinforced concrete structures with a reinforced concrete roof supported on structural steel framing. The roof and exterior walls protect the interior equipment from tornado damage.

The diesel generator building housing four EDGs is a one-story reinforced concrete structure with a concrete roof supported by steel. The four EDG foundations are of reinforced concrete isolated from the remainder of the structure. Concrete or reinforced concrete block walls

separate each diesel generator unit from the adjacent unit. Building construction is to SEISMIC Class I and tornado protection design criteria. Each diesel generator unit has its own independent fuel oil system consisting of a main fuel storage tank, a day tank, and pumps. The main tanks are buried below the subgrade and anchored to the rock foundation.

The main stack is an unlined, free-standing, SEISMIC Class I reinforced concrete structure founded on a reinforced concrete mat anchored to bedrock with grouted reinforcing rods. The stack sits on a circular filter room of reinforced concrete that houses dilution fans, off-gas filters, and monitoring equipment.

Manholes and duct banks for underground routing of cables and piping are structural components of concrete or reinforced concrete construction.

The nitrogen building housing containment air dilution equipment including liquid nitrogen storage tanks is at the south end of the reactor building with north and east side walls and floor constructed of reinforced concrete. The remaining walls are steel frame with metal siding. The roof is constructed of metal decking, insulation, and built-up roofing.

The SEISMIC Class II radioactive waste building is located east of the water treating building and houses the equipment to handle liquid and solid radioactive wastes from the reactor building and turbine building equipment.

The security building houses the security generator credited as a source of backup power to the security lighting system, including the perimeter fence lighting, which illuminates exterior access and egress in a fire with loss of 115KV offsite power.

The SGT building is a poured-in-place reinforced concrete structure adjacent to the reactor building southeast corner. All construction joints below grade have preformed water stops for water-tightness and vertical joints above grade for airtightness. The roof is constructed of reinforced concrete.

The transformer/switchyard support structures physically support the reserve service transformers T2 or T3 and the other switchyard components in the SBO recovery path. These support structures include the transformer foundations, transformer pothead foundations and support steel, and foundations for the switchyard breakers.

The transmission towers physically support the transmission lines in the SBO recovery path. The transmission tower structures are the tower foundations and tower steel. The SEISMIC Class II transmission tower is of galvanized steel construction on a reinforced concrete foundation.

The turbine building and heater bay house the main turbine generator, condensate/feedwater system, and other plant auxiliary systems. The building is a reinforced concrete structure with concrete floors supported by structural steel. The superstructure housing the turbine building crane is a structural steel frame covered with insulated metal siding and a metal roof deck with insulation and built-up roofing. The interior walls of the turbine building are reinforced concrete or concrete block designed to shield plant personnel and equipment from radiation and protect them from fire. The SEISMIC Class II heater bay housing the feedwater heaters as part of the

turbine building is constructed of reinforced concrete below ground level with concrete and grating floors supported by structural steel. The superstructure of one exterior wall and roof has a structural steel frame. The exposed wall is insulated metal siding and the roof is of metal deck construction with insulation and built-up roofing except directly over the heaters where it is of reinforced concrete for radiation protection.

The turbine building complex and yard structures have safety-related components relied upon to remain functional during and following DBEs. The failure of nonsafety-related turbine building complex and yard structure SSCs potentially could prevent the satisfactory accomplishment of a safety-related function. In addition, the turbine building complex and yard structures perform functions that support fire protection and SBO.

LRA Table 2.4-3 identifies the following turbine building complex and yard structure component types within the scope of license renewal and subject to an AMR:

- steel
- other metals
- concrete

The turbine building complex and yard structure component intended functions within the scope of license renewal include:

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- missile barrier
- pressure boundary
- structural or functional support to nonsafety-related equipment the failure of which could impact safety-related equipment
- structural or functional support for fire protection, EQ, PTS, ATWS, or SBO
- structural or functional support for safety-related equipment

2.4.3.2 Staff Evaluation

The staff reviewed LRA Section 2.4.3 and UFSAR Sections 5.2.3.8.6, 8.4, 8.5, 10.9.3, 12.2.2, 12.3.1, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.9, and 12.3.12, and using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

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

The staff's review of LRA Section 2.4.3 found 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 follows.

In RAI 2.4.3-1 dated November 29, 2006, the staff noted that UFSAR Section 12.3.9 states, "The stack is not specifically designed to resist a tornado." The staff needed additional information about the potential interaction between SEISMIC Class II SSCs and tornado-induced failure of the main stack. Specifically, the staff asked the applicant what appropriate measures it had taken to prevent interactions between the main stack and nearby SEISMIC Class I and Class II SSCs the failure of which might have adverse effects on SEISMIC Class I SSCs.

In its response dated December 28, 2006, the applicant confirmed, as to the main stack and its possible interaction with structural commodities, that a tornado-induced failure of the main stack would not interact with nearby SEISMIC Class II SSCs the failure of which might cause loss of SEISMIC Class I SSC intended functions. As stated in LRA Section 2.4.3, the main stack is a SEISMIC Class I reinforced concrete structure located sufficiently far from other SEISMIC Class I structures to preclude interaction, including that caused by interaction with nearby SEISMIC Class II SSCs the failure of which might have adverse effects on SEISMIC Class I SSCs.

By letter dated April 2, 2007, the staff asked the applicant to demonstrate with a sketch showing the distance from the stack to SEISMIC Classes I and II structures with potential tornado-induced interaction that the main stack is sufficiently far from SEISMIC class I structures.

In its response dated April 24, 2007, the applicant stated that the main stack is designed as a SEISMIC Class I structure but not for tornado loads. The nearest SEISMIC Class I or II structure to the stack is the SGT room at a distance slightly less than the "topple" zone of the main stack. Site drawings FY-12B and FY-12D (attached to the response) show the main stack and reactor track bay (which contains the SGT room). Calculation JAF-CALC-BYM-04122 confirmed a crushing and "breaking" main stack failure mode at a location above the base. The calculation conclusion states that interaction of a main stack failure with the SGT room is unlikely. For license renewal, the main stack is within the scope of license renewal and subject to an AMR. the Structures Monitoring Program manages the effects of aging on the main stack.

Based on its review, the staff finds the applicant's response to RAI 2.4.3-1 acceptable because, after examining the locations of the nearby structures and components, the applicant concluded that interaction of a main stack failure with SEISMIC Class I or II structures is unlikely. The staff agrees with the applicant's conclusion. The staff's concern described in RAI 2.4.3-1 is resolved.

In RAI 2.4.3-2 dated November 29, 2006, the staff noted that LRA Section 2.4-3 states that, "The main steam lines to the turbine generator from the reactor are housed in a reinforced concrete tunnel that enters the turbine building after passing under the adjacent administration building." The staff needed additional information about the potential interaction between the administration building and any failure of main steam lines. Specifically, the staff asked the applicant what appropriate measures it had taken to prevent failure of the MS lines with adverse effect on the administration building.

In its response dated December 28, 2006, the applicant stated that LRA Section 2.3.4.2 addresses and LRA Table 3.3.2-14-16 lists the MS lines. Appropriate measures (AMPs) are in place to manage the effects of aging and to prevent MS line failure and the potential effect on the administration building.

Based on its review, the staff finds the applicant's response to RAI 2.4.3-2 acceptable. The staff's concern described in RAI 2.4.3-2 is resolved.

In RAI 2.4.3-3 dated November 29, 2006, the staff noted that LRA Table 2.4-3 lists "Exterior walls" as a component. The staff could not determine whether this component included the main stack, MS line tunnel, and electric bay tunnel. The staff asked the applicant to include these components within the scope of license renewal.

In its response dated December 28, 2006, the applicant stated that exterior walls are defined as walls that form the perimeter base of a structure with their primary surface or both surfaces exposed to an outdoor or soil environment (*i.e.*, exposed to weather). This definition would include the exterior walls of those structures listed.

Based on its review, the staff finds the applicant's response to RAI 2.4.3-3 acceptable. The staff's concern described in RAI 2.4.3-3 is resolved.

In RAI 2.4.3-4 dated November 29, 2006, the staff noted that LRA Table 2.4-3 does not include sumps that functionally support safety-related and nonsafety-related equipment. The staff requested justification for their exclusion from the scope of license renewal.

In its response dated December 28, 2006, the applicant stated that the in-scope unlined sumps in the east cable tunnel are parts of the concrete floor structure. There are no other sumps in the turbine building complex and yard structures that functionally support safety-related and nonsafety-related equipment. LRA Section 2.3.3.12 addresses turbine building equipment drain tanks within the scope of license renewal.

Based on its review, the staff finds the applicant's response to RAI 2.4.3-4 acceptable. The staff's concern described in RAI 2.4.3-4 is resolved.

2.4.3.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 complex and yard structures components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.4.4 Bulk Commodities

2.4.4.1 Summary of Technical Information in the Application

LRA Section 2.4.4 describes the bulk commodities, which are structural components or commodities that perform or support intended functions of in-scope SSCs.

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

LRA Table 2.4-4 identifies the following bulk commodity component types within the scope of license renewal and subject to an AMR:

- steel and other metals
- bolted connections
- concrete
- other materials

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

- shelter or protection to safety-related equipment, including radiation shielding and pipe whip restraint
- rated fire barrier to confine or retard a fire from spreading
- protective barrier for flood events
- insulation
- missile barrier
- pressure boundary
- structural or functional support to nonsafety-related equipment whose failure could impact safety-related equipment
- structural or functional support for fire protection, EQ, PTS, ATWS, or SBO
- structural or functional support for safety-related equipment

2.4.4.2 Staff Evaluation

The staff reviewed LRA Section 2.4.4 using the evaluation methodology described in SER Section 2.4 and the guidance in SRP-LR Section 2.4.

During its review, the staff evaluated the structural component functions described in the LRA and UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to

verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

In RAI 2.4.4-1 dated November 29, 2006, the staff noted that LRA Table 2.4-4 lists bulk commodities. The location of each component was unclear to the staff. The staff requested a description of all listed commodities as well as a comprehensive listing of components, component supports, and locations for each commodity.

In its response dated December 28, 2006, the applicant explained that, as stated in LRA Section 2.4.4, LRA Table 2.4-4 lists the bulk commodities common to in-scope structures. Commodities unique to any specific structure are included in the review for that structure (LRA Sections 2.4.1 through 2.4.3). The commodities listed in LRA Table 2.4-4 are within the scope of license renewal and subject to an AMR regardless of the in-scope structure in which located. Components classified as bulk commodities typically have no unique component identification numbers. Therefore, a comprehensive listing of components and locations is not feasible.

Based on its review, the staff finds the applicant's response to RAI 2.4.4-1 acceptable because the staff agrees with the applicant's reasons for not listing bulk commodities. The staff's concern described in RAI 2.4.4-1 is resolved.

In RAI 2.4.4-2 dated November 29, 2006, the staff noted that LRA Table 2.4-4 lists "insulation" with intended functions. It was unclear to the staff why "Support for Criterion (a)(1) equipment" was not an intended function when the LRA Table 2.0-1 definition of the intended function of "insulation" meant to apply to safety-related and nonsafety-related components is "provide insulating characteristics to reduce heat transfer." The staff requested additional information on insulation and a list of in-scope components with insulation included with their intended functions.

In its response dated December 28, 2006, the applicant stated that LRA Table 2.4-4 lists two functions for insulation. LRA Table 2.0-1 defines the first, "Insulation," as, "Provide insulating characteristics to reduce heat transfer." This function applies to safety-related and nonsafety-related components. LRA Table 2.0-1 defines the second function, "Support for Criterion (a)(2) equipment," as, "Provide structural or functional support to nonsafety-related equipment whose failure could impact safety-related equipment." This definition means nonsafety-related insulation must maintain integrity so falling insulation does not damage safety-related equipment. Therefore, "Support for Criterion (a)(1) equipment" need not be listed as a separate intended function for insulation.

The applicant also stated that examples of in-scope components with insulation addressed by this LRA Table 2.4-4 line item are the recirculation system piping, valves, and pump casings and MS SRVs. The applicant evaluated insulation as a commodity because development of a list of individual components insulated was not practical. Therefore, a list of insulated components is not available.

Based on its review, the staff finds the applicant's response to RAI 2.4.4-2 acceptable because it explained the intended functions of the insulation and clarified component insulation included within the scope of the license renewal. The staff's concern described in RAI 2.4.4-2 is resolved.

In RAI 2.4.4-1F dated January 12, 2007, the staff stated that LRA Section 2.4.4 includes review of bulk commodities such as structural components or commodities that support intended functions of in-scope SSCs. It is not clear from the review of LRA Tables 2.4-4, “Bulk Commodities Summary of Components Subject to Aging Management Review,” and 3.5.2-4, “Bulk Commodities Summary of Aging Management Evaluation,” that the structural fire barriers (walls, ceilings, floors, and slabs) 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 these structural fire barriers are excluded from the scope of license renewal and not subject to an AMR, the staff requested that the applicant provide justification for the exclusion.

In its response dated February 12, 2007, the applicant stated that the structural fire barriers (walls, ceilings, floors and slabs) are within the scope of license renewal and subject to an AMR. They are listed within the tables of the associated structures with an intended function “FB." The AMP for these commodities is the Fire Protection Program.

Based on its review, the staff finds the applicant's response to RAI 2.4.4-1F acceptable because 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, floors and slabs are represented in the LRA tables of the associated structures with an intended function “FB.” Therefore, the staff concludes that the structural fire barriers are correctly included within the scope of license renewal and subject to an AMR. The staff’s concern described in RAI 2.4.4-1F is resolved.

2.4.4.3 Conclusion

The staff reviewed the LRA and related structural components to determine whether the applicant failed to identify any SSCs within the scope of license renewal. 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 bulk commodities components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.5 Scoping and Screening Results: Electrical and Instrumentation and Control Systems

This section documents the staff’s review of the applicant’s scoping and screening results for electrical and instrumentation and controls (I&C) 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 electrical and I&C system components that meet the scoping criteria and are subject to an AMR.

The staff’s evaluation of the information in the LRA was the same for all electrical and I&C systems. The objective was to determine whether the applicant has identified, in accordance with 10 CFR 54.4, components and supporting structures for electrical and I&C systems that

appear to meet the license renewal scoping criteria. Similarly, the staff evaluated the applicant's screening results to verify that all passive, long-lived components were subject to an AMR in accordance with 10 CFR 54.21(a)(1).

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

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

2.5.1 Summary of Technical Information in the Application

LRA Section 2.5.1 describes the electrical and I&C systems, which are included within the scope of license renewal as are electrical and I&C components in mechanical systems. The default inclusion of plant electrical and I&C systems within the scope of license renewal reflects the method for the IPAs of electrical systems. This method is different from those for IPAs of mechanical systems and structures.

The basic philosophy of the electrical and I&C components IPA is to include components not specifically screened out. When used with the plant spaces approach, this method eliminates the need for unique identification of every component and its specific location so components are not improperly excluded from AMR. The electrical and I&C IPA begins with commodity groups of similar electrical and I&C components with common characteristics and component intended functions of the groups. The IPA eliminates commodity groups and specific plant systems from further review as it examines intended functions of commodity groups. In addition to the plant electrical systems the IPA conservatively includes within the scope of license renewal certain switchyard components required to restore offsite power following an SBO.

The electrical and I&C system performs functions that support SBO.

LRA Table 2.5-1 identifies the following electrical and I&C system component types within the scope of license renewal and subject to an AMR:

- cable connections (metallic parts)
- electrical cables and connections not subject to 10 CFR 50.49 EQ requirements

- electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits
- fuse holders (insulation material)
- high-voltage insulators (for SBO)
- metal-enclosed bus (non-segregated bus for SBO), connections
- metal-enclosed bus (non-segregated bus for SBO), insulation/insulators
- metal-enclosed bus (non-segregated bus for SBO) enclosure assemblies
- oil-filled cable system (passive mechanical for SBO)
- oil-filled cable system (passive electrical for SBO)
- switchyard bus (switchyard bus for SBO), connections
- transmission conductors (transmission conductors for SBO), connections

The electrical and I&C system component intended functions within the scope of license renewal include:

- electrical connections for voltage, current, or signals
- insulation and support for electrical conductors
- pressure boundary
- structural or functional support for fire protection, EQ, PTS, ATWS, or SBO

2.5.2 Staff Evaluation

The staff reviewed LRA Section 2.5.1 and the UFSAR 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 UFSAR to verify that the applicant has not omitted from the scope of license renewal any components with intended functions delineated under 10 CFR 54.4(a). The staff then reviewed those components that the applicant has identified as within the scope of license renewal to verify that the applicant has not omitted any passive and long-lived components subject to an AMR in accordance with the requirements of 10 CFR 54.21(a)(1).

In RAI 2.5-1 dated January 12, 2007, the staff asked the applicant to clarify why the switchyard bus was not shown in license renewal Figure 2.5-1 even though included in the list of components/commodity groups subject to an AMR.

In its response dated February 12, 2007, the applicant stated that the switchyard bus within the scope of license renewal and subject to an AMR consists of short sections that connect to the 115 kilo-volt (kV) underground oil-filled transmission cables at reserve station service transformer (T2) and switchyard breaker (10022). Also included are the short sections that connect to the overhead transmission conductors at reserve station service transformer (T3) and switchyard breaker (10012). The applicant updated license renewal Figure 2.5-1.

Based on its review, the staff finds the applicant's response to RAI 2.5-1 acceptable. The staff's concern described in RAI 2.5-1 is resolved.

2.5.3 Conclusion

The staff reviewed the LRA and UFSAR, and the supplemental information in the applicant's letter dated February 12, 2007, 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 electrical and I&C system components within the scope of license renewal, as required by 10 CFR 54.4(a), and those subject to an AMR, as required by 10 CFR 54.21(a)(1).

2.6 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 James A. FitzPatrick Nuclear Power Plant (JAFNPP), by the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff). In Appendix B of its license renewal application (LRA), Entergy Nuclear Operations, Inc. (ENO or the applicant) described the 35 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 November 13-17, 2006, December 11-15, 2006, and January 8-9, 2007. The staff conducted its audits and reviews in accordance with the Audit Plan (Agencywide Documents Access and Management System (ADAMS) Accession No. ML0627801551). The onsite audits and reviews are designed for maximum efficiency and effectiveness 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. The audit questions are documented in an audit and review question and answer database that can be viewed through ADAMS Accession No. ML070380231. In addition, the staff issued an audit summary (ADAMS Accession No. ML071580047) of the audit and review results on June 19, 2007.

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 (ML030990052). This revised LRA format incorporates lessons learned from the staff's reviews of the previous five LRAs, which used a format developed from information gained during a staff-NEI demonstration project conducted to evaluate the use of the GALL Report in the LRA review process.

The organization of LRA Section 3 parallels that of SRP-LR Chapter 3. LRA Section 3 presents AMR results information in the following two table types:

(1) Table 1s: Table 3.x.1 – where "3" indicates the LRA section number, "x" indicates the subsection number from the GALL Report, and "1" indicates that this table type is the first in LRA Section 3.

(2) Table 2s: Table 3.x.2-y – where "3" indicates the LRA section number, "x" indicates the subsection number from the GALL Report, "2" indicates that this table type is the second in LRA Section 3, and "y" indicates the system table number.

The content of the previous LRAs and of the JAFNPP application is essentially the same. The intent of the revised format of the 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 core spray system, high pressure coolant injection system, and residual heat removal system. 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 such consistency.

(2) For items that the applicant stated were consistent with the GALL Report with exceptions, enhancements, or both, the staff conducted either an audit or a technical review of the item to determine such consistency. In addition, the staff conducted either an audit or a technical review of the applicant's technical justifications for the exceptions or the adequacy of the enhancements.

The SRP-LR states that an applicant may take one or more exceptions to specific GALL AMP elements; however, any deviation from or exception to the GALL AMP should be described and justified. Therefore, the staff considers exceptions as being portions of the GALL AMP that the applicant does not intend to implement.

In some cases, an applicant may choose an existing plant program that does not meet all the program elements defined in the GALL AMP. However, the applicant may make a commitment to augment the existing program to satisfy the GALL AMP prior to the period of extended operation. Therefore, the staff considers these augmentations or additions to be enhancements. Enhancements include, but are not limited to, activities needed to ensure consistency with the GALL Report recommendations. Enhancements may expand, but not reduce, the scope of an AMP.

(3) For other items, the staff conducted a technical review to verify conformance with 10 CFR 54.21(a)(3) requirements.

Staff audits and technical reviews of the applicant's AMPs and AMRs determine whether the aging effects on SCs will 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 the Audit Summary report dated June 19, 2007 (ADAMS Accession No. ML071580047), and are summarized 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.

3.0.2.2 Review of AMR Results

Each LRA Table 2 contains information concerning whether or not the AMRs identified by the applicant algin 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 UFSAR Supplement

Consistent with the SRP-LR for the AMRs and AMPs that it reviewed, the staff also reviewed the UFSAR supplement, which summarizes the applicant's programs and activities for managing the effects of aging for the period of extended operation, as required by 10 CFR 54.21(d).

3.0.2.4 Documentation and Documents Reviewed

In its review, the staff used the LRA, LRA supplements, the SRP-LR, and the GALL Report.

During the onsite audit, the staff also examined the applicant's justifications to verify that the applicant's activities and programs will adequately manage the effects of aging on SCs. The staff also conducted detailed discussions and interviews with the applicant's license renewal project personnel and others with technical expertise relevant to aging management.

The staff noted that the LRA did not include a complete "Commitment List," and descriptions of some proposed new AMPs and AMP "enhancements" in LRA Appendix A are incomplete.

The staff's review of LRA Appendix A found an area in which additional information was necessary to complete the review of the applicant's regulatory commitments. The applicant responded to the staff's request for additional information (RAI).

In RAI Appendix A-1 dated November 7, 2006, the staff requested a commitment list showing all regulatory commitments.

In its response dated December 6, 2006, the applicant submitted the commitment list, LRA, Revision 0, Amendment 1, Attachment 1. After the staff's audit and review, the applicant revised this commitment list in its letter dated February 1, 2007, LRA Amendment No. 5.

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 SCs 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 JAFNPP Aging Management Programs

JAFNPP AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Existing AMPs				
BWR CRD Return Line Nozzle Program (B.1.2)	Consistent with exceptions and enhancement	XI.M6	reactor vessel, internals, and reactor coolant system	3.0.3.2.2
BWR Feedwater Nozzle Program (B.1.3)	Consistent with exception	XI.M5	reactor vessel, internals, and reactor coolant system	3.0.3.2.3
BWR Penetrations Program (B.1.4)	Consistent with exception	XI.M8	reactor vessel, internals, and reactor coolant system	3.0.3.2.4
BWR Stress Corrosion Cracking Program (B.1.5)	Consistent with exception	XI.M7	reactor vessel, internals, and reactor coolant system	3.0.3.2.5
BWR Vessel ID Attachment Welds Program (B.1.6)	Consistent with exception	XI.M4	reactor vessel, internals, and reactor coolant system	3.0.3.2.6
BWR Vessel Internals Program (B.1.7)	Consistent with exceptions	XI.M9	reactor vessel, internals, and reactor coolant system	3.0.3.2.7
Containment Leak Rate Program (B.1.8)	Consistent	XI.S4	structures and component supports	3.0.3.1.1
Diesel Fuel Monitoring Program (B.1.9)	Consistent with exception and enhancements	XI.M30	auxiliary systems	3.0.3.2.8
Environmental Qualification of Electric Components Program (B.1.10)	Consistent	X.E1	electrical and instrumentation and controls	3.0.3.1.2

JAFNPP AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
External Surfaces Monitoring Program (B.1.11)	Consistent with enhancement	XI.M36	reactor vessel, internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems / electrical and instrumentation and controls	3.0.3.2.9
Fatigue Monitoring Program (B.1.12)	Consistent with exceptions	X.M1	reactor vessel, internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems structures / and component supports	3.0.3.2.10
Fire Protection Program (B.1.13.1)	Consistent with enhancements	XI.M26	auxiliary systems / structures and component supports	3.0.3.2.11
Fire Water System Program (B.1.13.2)	Consistent with exceptions and enhancements	XI.M27	auxiliary systems / structures and component supports	3.0.3.2.12
Flow-Accelerated Corrosion Program (B.1.14)	Consistent	XI.M17	reactor vessel, internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.1.3
Containment Inservice Inspection Program (B.1.16.1)	Plant-specific		structures and component supports	3.0.3.3.2
Inservice Inspection Program (B.1.16.2)	Plant-specific		reactor vessel, internals, and reactor coolant system / structures and component supports	3.0.3.3.3
Oil Analysis Program (B.1.20)	Consistent with exception and enhancements	XI.M39	engineered safety features systems / auxiliary systems / electrical and instrumentation and controls	3.0.3.2.14
Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Plant-specific		engineered safety features systems / auxiliary systems / structures and component supports	3.0.3.3.4
Reactor Head Closure Studs Program (B.1.23)	Consistent with exception	XI.M3	reactor vessel, internals, and reactor coolant system	3.0.3.2.15
Reactor Vessel Surveillance Program (B.1.24)	Consistent with enhancement	XI.M31	reactor vessel, internals, and reactor coolant system	3.0.3.2.16

JAFNPP AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
Service Water Integrity Program (B.1.26)	Consistent with exception	XI.M20	engineered safety features systems / auxiliary systems	3.0.3.2.17
Masonry Wall Program (B.1.27.1)	Consistent	XI.S5	structures and component supports	3.0.3.1.8
Structures Monitoring Program (B.1.27.2)	Consistent with enhancements	XI.S6	structures and component supports	3.0.3.2.18
Water Chemistry Control - Auxiliary Systems Program (B.1.29.1)	Plant-specific		auxiliary systems	3.0.3.3.5
Water Chemistry Control - BWR Program (B.1.29.2)	Consistent	XI.M2	reactor vessel, internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems structures / and component supports	3.0.3.1.10
Water Chemistry Control - Closed Cooling Water Program (B.1.29.3)	Consistent with exception	XI.M21	reactor vessel, internals, and reactor coolant system / engineered safety features systems / auxiliary systems	3.0.3.2.19
New AMPs				
Buried Piping and Tanks Inspection Program (B.1.1)	Consistent with exception	XI.M34	engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.2.1
Heat Exchanger Monitoring Program (B.1.15)	Plant-specific		engineered safety features systems / auxiliary systems	3.0.3.3.1
Metal-Enclosed Bus Inspection Program (B.1.17)	Consistent with exception	XI.E4	electrical and instrumentation and controls	3.0.3.2.13
Non-EQ Instrumentation Circuits Test Review Program (B.1.18)	Consistent	XI.E2	electrical and instrumentation and controls	3.0.3.1.4
Non-EQ Insulated Cables and Connections Program (B.1.19)	Consistent	XI.E1	electrical and instrumentation and controls	3.0.3.1.5

JAFNPP AMP (LRA Section)	GALL Report Comparison	GALL Report AMPs	LRA Systems or Structures That Credit the AMP	Staff's SER Section
One-Time Inspection Program (B.1.21)	Consistent	XI.M32 XI.M35	engineered safety features systems / auxiliary systems	3.0.3.1.6
Selective Leaching Program (B.1.25)	Consistent	XI.M33	engineered safety features systems / auxiliary systems	3.0.3.1.7
Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program (B.1.28)	Consistent	XI.M13	reactor vessel, internals, and reactor coolant system	3.0.3.1.9
Bolting Integrity Program (B.1.30)	Consistent with enhancements	XI.M18	reactor vessel, internals, and reactor coolant system / engineered safety features systems / auxiliary systems / steam and power conversion systems	3.0.3.2.20
Bolted Connection Program (B.1.31)	Plant-specific		electrical and instrumentation and controls	3.0.3.3.6

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:

- Containment Leak Rate Program
- Environmental Qualification of Electric Components Program
- Flow-Accelerated Corrosion Program
- Non-EQ Instrumentation Circuits Test Review Program
- Non-EQ Insulated Cables and Connections Program
- One-Time Inspection Program
- Selective Leaching Program
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program
- Water Chemistry Control - BWR Program

3.0.3.1.1 Containment Leak Rate Program

Summary of Technical Information in the Application. LRA Section B.1.8 describes the existing Containment Leak Rate Program as consistent with GALL AMP XI.S4, "10 CFR 50, Appendix J."

Containment leak rate tests are required for assurance that (a) leakage through primary reactor containment and systems and components penetrating the primary containment does not exceed allowable technical specifications or their bases and (b) there is periodic surveillance of reactor containment penetrations and isolation valves so that proper maintenance and repairs are made during the service life of the containment and systems and components penetrating the primary containment.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Containment Leak Rate Program bases documents. Specifically, the staff reviewed the program elements and corresponding bases documents for consistency with GALL AMP XI.S4. The staff noted that the applicant chose 10 CFR Part 50, Appendix J, Option B (performance-based approach) for implementing this program. The containment leak rate tests are in accordance with the guidance of Regulatory Guide (RG) 1.163 and NEI 94-01. The staff finds the applicant's Containment Leak Rate Program acceptable consistent with GALL AMP XI.S4, including the operating experience attribute, and acceptable.

Operating Experience. LRA Section B.1.8 states that during the most recent integrated leakage testing of the primary containment as-found and as-left test data met all applicable test acceptance criteria with no degradation threatening the structural integrity of the containment, indicating the program's effective management of the effects of loss of material and cracking on primary containment components. A QA audit in March 2002 and self-assessments in 2004 and 2005 revealed no issues or findings with impact on program effectiveness. As stated in GALL Report Section XI.S4, "To date, the 10 CFR Part 50, Appendix J, LRT program has been effective in preventing unacceptable leakage through the containment pressure boundary. Implementation of Option B for testing frequency must be consistent with plant-specific operating experience." The program is consistent with the GALL Report and 10 CFR Part 50, Appendix J requirements and, therefore, effective at managing loss of material and cracking on primary containment components.

The staff reviewed the operating experience in the LRA and operating experience reports and also interviewed the applicant's technical personnel and confirmed that plant-specific operating experience shows no aging effects for systems and components within the scope of this program not bounded by industry operating experience. The staff noted there were no aging-related condition reports (CRs) of degradation that would threaten the structural integrity of the containment. The staff finds this fact an acceptable indication that components have experienced no aging effects not bounded by industry operating experience.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concluded that the applicant's Containment Leak Rate Program will adequately manage the aging effects for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.8, the applicant provided the UFSAR supplement for the Containment Leak Rate Program. The staff determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Containment Leak Rate Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.2 Environmental Qualification of Electric Components Program

Summary of Technical Information in the Application. LRA Section B.1.10 describes the existing Environmental Qualification of Electric Components Program as consistent with GALL AMP X.E1, "Environmental Qualification (EQ) of Electric Components."

The NRC specifically requires EQ programs to demonstrate that certain electrical components are qualified to perform their safety function in harsh plant environments. Under 10 CFR 50.49 the effects of significant aging mechanisms must be addressed as part of EQ. The EQ of Electric Components Program manages the effects of thermal, radiation, and cyclic aging through aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components are refurbished or replaced or their qualification is extended prior to reaching the aging limits established in the evaluation. Aging evaluations for EQ components are time-limited aging analyses (TLAAs) for license renewal.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Environmental Qualification (EQ) of Electrical Components Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP X.E1.

Based on its review, the staff concludes that the applicant's Environmental Qualification (EQ) of Electric Components Program reasonably assures management of thermal, radiation, and cyclical aging effects for electrical equipment important to safety and located in harsh environments. The staff finds the applicant's Environmental Qualification (EQ) of Electric Components Program acceptable as consistent with the recommended GALL AMP X.E1, "Environmental Qualification (EQ) of Electric Components."

Operating Experience. LRA Section B.1.10 states that in September 1994 the applicant detected incorrect assumptions in EQ analyses. Corrective actions included modifications of the assumptions, evaluation of assumptions in other program documents, and evaluation of environmental conditions. Detection of incorrect assumptions and timely corrective actions prove that the program is effective in assuring that equipment is maintained within its qualification basis and qualified life. The staff reviewed examples of the applicant's operating

experience evaluations. The staff noted that in 2002, a 10 CFR Part 21 notification was made of an error in dose units for irradiation during EGS Electrical Cable Connectors Qualification Testing by Georgia Tech's Neely Nuclear Research Center. The applicant evaluated the affected equipment qualified to account for the error. Detection of incorrect assumptions and timely corrective actions prove that the program is effective in maintaining equipment within its qualification basis and qualified life.

In its response to a Nuclear Industry Advisory dated May 18, 2006, of an EQ issue with conduit seals installed on Barton transmitters from 1982 to 2006, the applicant reviewed its impact on equipment qualifications. The applicant identified all nonconforming seals per the advisory letter and replaced them with qualified alternate conduit seals. The applicant also updated the affected EQ files.

The overall effectiveness of the EQ of Electric Components Program is demonstrated by the excellent operating experience for program systems, structures, and components. A snapshot self-assessment in July 2004 revealed no issues or findings with impact on program effectiveness.

The staff interviewed the applicant's technical personnel and also reviewed the operating experience reports to confirm that plant-specific operating experience revealed no degradation not bounded by industry experience.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Environmental Qualification (EQ) of Electric Components Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.10, the applicant provided the UFSAR supplement for the Environmental Qualification of Electric Components Program. The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Environmental Qualification of Electric Components Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.3 Flow-Accelerated Corrosion Program

Summary of Technical Information in the Application. LRA Section B.1.14 describes the existing Flow-Accelerated Corrosion Program as consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion."

The Flow-Accelerated Corrosion Program applies to safety-related and nonsafety-related carbon steel components in systems containing high-energy fluids and carrying two-phase or single-phase high-energy fluid greater than 2 percent of plant operating time. The program, based on Electric Power Research Institute (EPRI) recommendations for an effective flow-accelerated corrosion program, predicts, detects, and monitors flow-accelerated corrosion (FAC) in plant piping and other pressure-retaining components. This program includes (a) an evaluation to determine critical locations, (b) initial operational inspections to determine the extent of thinning at such locations, and (c) follow-up inspections to confirm predictions or repair or replace components as necessary.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Flow-Accelerated Corrosion Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.M17.

NRC Bulletin 87-01, "Thinning of Pipe Walls in Nuclear Power Plants" (November 6, 1987) and NRC Generic Letter 89-08, "Erosion/Corrosion-Induced Pipe Wall Thinning" (May 2, 1989) provide the NRC's bases for implementing flow-accelerated corrosion programs at U.S. nuclear power plants. The staff determined that the Flow-Accelerated Corrosion Program monitors for loss of material due to flow-accelerated corrosion in carbon steel piping components and alloy steel components containing less than one-percent Chromium as an alloying element. This is consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion," and is acceptable.

The staff also determined that the Flow-Accelerated Corrosion Program invokes the implementation guidelines established in EPRI Report No. NSAC-202L-R2. The staff determined the program also administratively requires the applicant to model and rank the susceptibility of its carbon steel and low-alloy steel piping components and to schedule and implement the UT examinations in accordance with the CHECKWORKS computer code. This includes incorporating the results of previous UT examinations into the CHECKWORKS modeling and using the results to re-establish the rankings of the piping and to determine and schedule those piping locations needing UT inspection at the next inspection period. This is consistent with GALL AMP XI.M17, "Flow-Accelerated Corrosion," and is acceptable.

Based on its review, the staff finds the applicant's Flow-Accelerated Corrosion Program consistent with the recommended GALL AMP XI.M17, "Flow-Accelerated Corrosion Program," and acceptable.

Operating Experience. LRA Section B.1.14 states that from 2000 through 2004, FAC ultrasonic (UT) examinations of carbon steel components in systems containing steam or treated water detected wall thinning due to corrosion, erosion, and FAC. Corrective actions were implemented

under the site Corrective Action Program. Detection of degradation and corrective action prior to loss of intended function proves that the program is effective for managing aging effects for fire barrier components. There were 11 FAC UT testing examinations during Refueling Outage (RO)16 (2004) on components in the feedwater and main steam systems. None of the examinations detected decreased wall thickness. Absence of loss of material proves that the program is effective for managing loss of material in carbon steel components.

During the audit and review, the staff asked the applicant how well the CHECKWORKS model predictions compared to the actual field measurements. The applicant stated that the specific software inputs for the JAFNPP application were verified properly and tested satisfactorily. Although minor changes in wall thickness were detected, the measurements confirmed that, overall, the CHECKWORKS model was conservative. The applicant also stated that it will update, refine, and calibrate the model continually based on comparison of inspection data to predicted wear rates.

The staff reviewed plant-specific operating experience with FAC and plant procedures. The staff reviewed a sample of CRs and found that the applicant had evaluated potential wall thinning from FAC properly and implemented appropriate corrective actions.

The staff reviewed the FAC records for the UT examinations that were performed during last refueling outage. The staff determined that the carbon steel components selected for ultrasonic inspection included a number of locations that were based on relevant industry experience events. The staff therefore concluded that the applicant includes relevant operating experience as part of the applicant's criteria for selecting plant carbon steel piping locations for UT examination. The staff also determined that the applicant replaces any carbon steel piping that have exhibited an unacceptable amount of FAC induced wear with stainless steel or chromium-molybdenum alloy steel piping containing greater than 1-1/4 percent chromium alloying content. The chromium levels in these steels makes the steel more resistant to FAC than are carbon steel materials.

Based on its review of the operating experience, plant-specific and generic operating experience records, and discussions with the applicant's technical personnel, the staff concludes that the applicant's Flow-Accelerated Corrosion Program incorporates the results of relevant industry experience and will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.15, the applicant provided the UFSAR supplement for the Flow-Accelerated Corrosion Program. The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Flow-Accelerated Corrosion Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately

managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.4 Non-EQ Instrumentation Circuits Test Review Program

Summary of Technical Information in the Application. LRA Section B.1.18 describes the new Non-EQ Instrumentation Circuits Test Review Program as consistent with GALL AMP XI.E2, “Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.”

The Non-EQ Instrumentation Circuits Test Review Program reviews calibration or surveillance results for non-EQ electrical cables in circuits with sensitive, high-voltage, low-level signals. Most neutron flux monitoring system cables and connections are calibrated as part of the instrumentation loop calibration at its normal frequency, which sufficiently indicates the need for corrective actions based on acceptance criteria for instrumentation loop performance. Calibration results will be reviewed every 10 years. Neutron flux monitoring system cables disconnected during instrument calibrations will be tested at least every 10 years by a proven method for detecting deterioration for the insulation system. Under the corrective action program, there will be an engineering evaluation when test acceptance criteria are not met and corrective actions, including modified inspection frequency, will maintain the intended functions of the cables consistently with the CLB for the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant’s claim of consistency with the GALL Report.

The staff interviewed the applicant’s technical personnel and reviewed the Non-EQ Instrumentation Circuits Test Review Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.E2.

The scope of GALL AMP XI.E2 applies to the cable system (cables and connections).

During the audit and review, the staff asked the applicant whether the tests include both cables and connections.

In its response, the applicant clarified that the Non-EQ Instrumentation Circuits Test Review Program includes both cables and connections (cable system) within the scope of license renewal.

Based on its review, the staff finds the applicant’s response acceptable.

The staff reviewed portions of the applicant’s Non-EQ Instrumentation Circuits Test Review Program for which the applicant claimed consistency with GALL AMP XI.E2 and found them consistent. The staff finds the applicant’s Non-EQ Instrumentation Circuits Test Review Program consistent with recommended GALL AMP XI.E2, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits," and acceptable.

Operating Experience. LRA Section B.1.18 states that the Non-EQ Instrumentation Circuits Test Review Program is a new program. Plant and industry operating experience will be considered in the development of this program. Industry operating experience that forms the basis for the program is described in the operating experience element of the GALL Report program description. The staff finds that plant-specific operating experience is consistent with that in the GALL Report program description and that this new program will reasonably assure management of aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extend operation. With additional operating experience lessons learned can be used to adjust the program as needed.

The staff interviewed the applicant's technical personnel and also reviewed operating experience reports that plant-specific operating experience revealed no degradation not bounded by industry experience.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Non-EQ Instrumentation Circuits Test Review Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.20, the applicant provided the UFSAR supplement for the Non-EQ Instrumentation Circuits Test Review Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that this new program is Commitment No. 9 (JAFP-06-0109, dated July 31, 2006) to be implemented before the period of extended operation.)

The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Non-EQ Instrumentation Circuits Test Review Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant will have in place a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 9, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.5 Non-EQ Insulated Cables and Connections Program

Summary of Technical Information in the Application. LRA Section B.1.19 describes the new Non-EQ Insulated Cables and Connections Program as consistent with GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements."

The Non-EQ Insulated Cables and Connections Program will provide reasonable assurance that intended functions of insulated cables and connections exposed to adverse environments of heat, radiation, and moisture can be maintained consistently with the CLB through the period of extended operation. An adverse environment is significantly more severe than the specified service condition for the insulated cable or connection. This program addresses plant cables and connections installed in adverse environments that are accessible. This program can be thought of as a sampling program. Selected cables and connections from accessible areas, representative of all cables in adverse environments, will be inspected and if an unacceptable condition or situation for a cable or connection in the sample is detected, a determination will be made whether the condition or situation affects other accessible cables or connections. The sample size will be increased based on the determination. The program will be implemented fully prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Non-EQ Insulated Cables and Connections Program and Non-EQ Instrumentation Circuits Test Review Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.E1.

The staff finds the applicant's Non-EQ Insulated Cables and Connections Program consistent with recommended GALL AMP XI.E1, "Electrical Cables and Connections Not Subject to 10 CFR50.49 Environmental Qualification Requirements," and acceptable.

Operating Experience. LRA Section B.1.19 states that the Non-EQ Insulated Cables and Connections Program is a new program. Plant and that industry operating experience will be considered in the development of this program. Industry operating experience that forms the basis for the program is described in the operating experience element of the GALL Report program description. The staff finds that plant-specific operating experience is consistent with the operating experience in the GALL Report program description and that this new program will reasonably assure management of aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extend operation. With additional operating experience, lessons learned can be used to adjust the program as needed.

The staff also interviewed the applicant's technical personnel and reviewed the operating experience reports and confirmed that plant-specific operating experience revealed no degradation not bounded by industry experience.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Non-EQ Insulated Cables and Connections Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.21, the applicant provided the UFSAR supplement for the Non-EQ Insulated Cables and Connections Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that this new program is Commitment No. 10 (JAFP-06-0109, dated July 31, 2006) to be implemented before the period of extended operation.

The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Non-EQ Insulated Cables and Connections Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 10, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.6 One-Time Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.21 describes the new One-Time Inspection Program as consistent with GALL AMP XI.M32, "One-Time Inspection" and GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping."

The program will include one activity to verify effectiveness of an AMP and activities to confirm the absence of aging effects as described below:

Water chemistry control programs	One-time inspection activity will verify the effectiveness of the water chemistry control AMPs by confirming no occurrence of unacceptable cracking, loss of material, or fouling.
Internal surfaces of high-pressure coolant injection system components containing untreated air.	One-time inspection will confirm no loss of material or loss so insignificant that no AMP is warranted.
Surfaces of carbon steel and cast iron plant drain components normally exposed to indoor air	One-time inspection will confirm no loss of material or loss so insignificant that no AMP is warranted
Internal surfaces of carbon steel emergency diesel generator system components containing untreated air	One-time inspection will confirm no cracking and loss of material or cracking and loss so insignificant that no AMP is warranted
Internal surfaces of stainless steel and aluminum components in the radioactive waste system containing raw water	One-time inspection will confirm no loss of material or loss so insignificant that no AMP is warranted
Internal surfaces of stainless steel and copper alloy components in the raw water treatment system containing raw water	One-time inspection will confirm no loss of material or loss so insignificant that no AMP is warranted
Internal surfaces of copper alloy components in the plumbing, sanitary and lab system and the city water system containing raw water	One-time inspection will confirm no loss of material or loss so insignificant that no AMP is warranted

Internal surfaces of scram accumulators	One-time inspection will confirm no loss of material or loss so insignificant that no AMP is warranted
Small bore piping in the reactor coolant system and associated systems that form the reactor coolant pressure boundary	One-time inspection will confirm no cracking and reduction of fracture toughness or cracking and reduction so insignificant that no AMP is warranted
Reactor vessel flange leakoff line	One-time inspection will confirm no cracking or cracking so insignificant that no AMP is warranted
Main steam flow restrictors (cast austenitic stainless steel (CASS))	One-time inspection will confirm no loss of material, cracking, or reduction of fracture toughness or loss, cracking, or reduction so insignificant that no AMP is warranted

The One-Time Inspection Program will include the following elements: (a) determination of the sample size based on an assessment of fabrication materials, environment, plausible aging effects, and operating experience, (b) identification of the inspection locations for the aging effect in the system or component, (c) determination of the inspection technique, including acceptance criteria that would be effective in managing the aging effect for which the component is inspected, and (d) evaluation of the need for follow-up inspections to monitor the progression of any aging degradation. When a one-time inspection reveals evidence of an aging effect, evaluation of the inspection results will indicate appropriate corrective actions. There will be an inspection within 10 years prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the One-Time Inspection Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMPs XI.M32 and XI.M35.

The staff noted in Attachment 2 of the program basis document for the applicant's One-Time Inspection Program a table describing various program elements. The table described in general terms the components and the sample population to be inspected.

During the audit and review, the staff asked the applicant how the sample size for each inspection will be developed and expanded if degradation is detected.

In its response, the applicant stated that the sample size will be based on EPRI 107514,"Age-Related Degradation Inspection Method and Demonstration," Chapter 4, which outlines a method for determining the number of inspections required for 90-percent assurance that 90 percent of the population experiences no degradation. Components with the same material-environment combinations at other facilities may be included in the sample. The program provides for increasing inspection sample size and locations in the event that aging effects are detected. Unacceptable inspection findings are evaluated in accordance with the JAFNPP corrective action process to determine the need for subsequent (including periodic) inspections and for monitoring and trending the results.

For verification of the effectiveness of the water chemistry programs, the scope will include a representative sample of the components crediting the Water Chemistry Program. Since

operating experience identified a history of low oxygen and high iron content in the reactor building closed loop cooling (RBCLC) system, the sample population will specifically include components in this system. For confirmation that aging is not occurring or is so insignificant that an AMP is not required, the table in Attachment 2 identifies specific components that will be inspected in the systems crediting the One-Time Inspection Program. The staff determined that the scope of this program is adequately described.

The table in Attachment 2 to the AMP basis document also shows the inspection techniques and the parameters to be monitored to detect the effects of aging managed. The parameters monitored include wall thickness, fouling, and the extent of cracking. Reduction of fracture toughness is also a parameter to be monitored by inspection of specific CASS components for the extent of cracking. Inspection techniques include visual examination, surface techniques, UT testing, and radiography. The inspections will be by qualified personnel following procedures consistent with ASME Boiler and Pressure Vessel Code (ASME Code), Section XI, and with 10 CFR Part 50, Appendix B.

The staff determined that the parameters to be monitored are consistent with the aging effects which the LRA credits this program. The inspection techniques are proven methods for detecting loss of wall thickness, fouling, and the extent of cracking, common in the industry, and, therefore, acceptable for the purposes of this AMP. For the detection of loss of fracture toughness, the staff determined that the One-Time Inspection Program is not sufficient because it does not include fracture toughness measurements and at least two measurements are needed to determine whether component fracture toughness has decreased. The staff recognizes that this AMP will inspect specific CASS components for the extent of cracking as an indicator of loss of fracture toughness. The staff finds this AMP acceptable for non-RCPB components. However, the staff finds that the One-Time Inspection Program alone is not sufficient to manage loss of fracture toughness for RCPB components since a reduction in fracture toughness will accelerate the propagation of existing cracks, which could lead to a loss of component intended function.

Finally, the table in Attachment 2 of the program basis document shows the acceptance criteria for whether corrective actions are needed based on inspection results. For inspections to detect cracking or corrosion, the acceptance criteria require corrective actions if any significant cracking or corrosion is detected. For UT inspections, the acceptance criteria require a comparison of measured thickness to predetermined limits with an evaluation of any degradation noted. The staff determined that these acceptance criteria will assure AMP effectiveness or no significant aging degradation, the two purposes for which the applicant credits this program.

The staff noted that the One-Time Inspection Program also will manage aging of small-bore piping, including socket welds. The staff considers the requirements of ASME Code Section XI, Subsection IWB acceptable for aging management of small-bore piping. The staff discussed the inspection of small-bore piping with the applicant and determined that its Risk-Informed Inservice Inspection (RI-ISI) Program monitors piping and piping elements. The inspections are in accordance with ASME Code Section XI inservice inspection (ISI) requirements. The Risk-Informed Inservice Inspection Program identifies risk-important pipe segments based upon contribution to plant risk. Each pipe segment may have multiple pipe welds inspected with the segment. During each ISI interval selected pipe segments are inspected by radiography, UT

testing, and surface techniques. Radiography is a volumetric examination, so when pipe segments with socket welds are inspected the applicant takes credit for volumetric inspections. Socket welds are required for piping 2 inches or less.

During the audit and review, the staff asked the applicant for additional details on the small-bore piping inspections for the period of extended operation to inspect piping socket welds.

In its response the applicant stated:

> JAFNPP meets the requirements of ASME Section XI with respect to the inspection of Class 1 small bore piping and socket welds through implementation of a risk-informed ISI program. During the period of extended operation, as required by 10 CFR 50.55a, JAFNPP will meet the requirements of ASME Section XI or implement an approved alternative such as the existing risk-informed ISI Program.
>
> The ISI program for small-bore piping at JAFNPP uses nondestructive examination (NDE) techniques to detect and characterize flaws. Three different types of examinations are volumetric, surface, and visual. Examinations performed on pipe segments within the 3rd interval inspection program have included the examination of associated socket welds. The pipe segments have been examined for FAC and thermal fatigue by ultrasonic's, radiography and surface examination (dependent upon flaw mechanism) that captures the associated socket welds verifying integrity. Surface examinations, such as magnetic particle or dye penetrant testing, are used to locate surface flaws. Three levels of visual examinations are specified. VT-1 visual examination is conducted to assess the condition of the surface of the part being examined, looking for cracks and symptoms of wear, corrosion, erosion or physical damage. It can be done with either direct visual observation or with remote examination using various optical and video devices. VT-2 visual examination is conducted specifically to locate evidence of leakage from pressure retaining components (periodic pressure tests). While the system is under pressure for a leakage test, visual examinations are conducted to detect direct or indirect indication of leakage. VT-3 visual examination is conducted to determine general mechanical and structural condition of components and supports and to detected discontinuities and imperfections.
>
> A preliminary review of Class 1 piping was performed to derive an estimated number of Class 1 socket welds and/or piping segments in accordance with the Risk-Informed Inservice Inspection Program (RI-ISI). The estimated total of Class 1 socket welds and/or piping segments is eight piping segments that are inspected in each ISI interval out of the total segments identified in the ISI program and includes approximately 15 welds out of the total class I socket weld population. The total number of inspections conducted during the 3rd ten-year ISI Interval estimated at approximately 5% of the total segments and 1% of the total welds.

> Examination Category B-F welds are scheduled and examined as part of the IGSCC Augmented Inspection Program. Extent and frequency of examinations are in accordance with the Risk-Informed ISI Program.

The staff reviewed the applicant's response and determined that the applicant's small-bore piping inspections are consistent with the staff-approved Risk-Informed Inservice Inspection Program and meet ASME Code Section XI, Subsection IWB, small-bore piping requirements.

The staff finds the applicant's One-Time Inspection Program consistent with recommended GALL AMP XI.M32, "One-Time Inspection," and GALL AMP XI.M35, "One-Time Inspection of ASME Code Class 1 Small-Bore Piping," and acceptable.

Operating Experience. LRA Section B.1.21 states that there is no operating experience for the new One-Time Inspection Program. The elements comprising this program are consistent with industry practice, which provides reasonable assurance that the One-Time Inspection Program will manage aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extend operation.

The staff reviewed the License Renewal Project Operating Experience Review Report in general for small-pipe issues. This report provides information from condition reports and program owner interviews and covers the last five years.

The staff's review confirmed that there had been no failures of Class 1 piping less than 4 inches NPS within the scope of this 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.23, the applicant provided the UFSAR supplement for the One-Time Inspection Program. In its letter dated February 1, 2007 (LRA Amendment 5), the applicant submitted Revision 1 to the license renewal commitment list. The applicant included Commitment No. 12 (JAFP-06-0109 dated July 31, 2006) for implementation of this new program. The applicant states that this program will be implemented prior to October 17, 2014.

The staff reviewed this section, including Commitment No. 12, and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's One-Time Inspection Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 12, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.7 Selective Leaching Program

Summary of Technical Information in the Application. LRA Section B.1.25 describes the new Selective Leaching Program as consistent with GALL AMP XI.M33, “Selective Leaching of Materials.”

The Selective Leaching Program will ensure the integrity of components made of cast iron, bronze, brass, and other alloys exposed to raw water, treated water, soil, or other environments that may lead to selective leaching. The program will include a one-time visual inspection and hardness measurement of selected components that may be susceptible to determine whether loss of material due to selective leaching has occurred and whether it affects the ability of the components to perform their intended function for the period of extended operation. The program will be implemented fully prior to the period of extended operation (Commitment No. 15 (JAFNPP-06-0109, dated July 31, 2006)).

Staff Evaluation. During its audit and review, the staff reviewed the applicant’s claim of consistency with the GALL Report.

The staff interviewed the applicant’s technical personnel and reviewed the Selective Leaching Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.M33.

The staff reviewed Selective Leaching Program portions for which the applicant claims consistency with GALL AMP XI.M33 and finds them consistent. The staff determined that the program element descriptions in the Selective Leaching Program conformed to corresponding program elements in GALL AMP XI.M33, “Selective Leaching of Materials." The staff finds the applicant’s Selective Leaching Program consistent with recommended GALL AMP XI.M33, “Selective Leaching of Materials,” and acceptable.

Operating Experience. LRA Section B.1.25 states that the Selective Leaching Program is a new program. The elements which comprise this program (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and staff expectations. As such, operating experience provides reasonable assurance that the Selective Leaching Program will manage aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extended operation.

During the audit and review, the applicant stated there is no programmatic operating experience available for this new program but that there had been no selective leaching. Also, industry operating experience with graphitization of cast iron components from long-term submersion in salt water is not applicable because there are no any salt water systems but the applicant will consider other industry operating experience during program implementation. The applicant stated that it would monitor water chemistry to control pH and concentration of corrosive contaminants and to minimize dissolved oxygen as part of the Water Chemistry Program to reduce selective leaching effectively.

The staff interviewed the applicant’s technical personnel and also reviewed the operating experience program basis document and confirmed that plant-specific operating experience revealed no degradation not bounded by industry operating experience.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Selective Leaching Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.27, the applicant provided the UFSAR supplement for the Selective Leaching Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1 dated February 1, 2007, and confirmed that this new program is Commitment No.15 (JAFP-06-0109, dated July 31, 2006) to be implemented before the period of extended operation.

The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Selective Leaching Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 15, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.8 Masonry Wall Program

Summary of Technical Information in the Application. LRA Section B.1.27.1 describes the existing Masonry Wall Program as consistent with GALL AMP XI.S5, "Masonry Wall Program."

The Masonry Wall Program manages aging effects so that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation. The program includes all masonry walls performing intended functions in accordance with 10 CFR 54.4. Included components are masonry walls required by 10 CFR 50.48, radiation-shielding masonry walls, and masonry walls with the potential to affect safety-related components. Masonry walls are visually examined at a frequency selected to ensure no loss of intended function between inspections.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Masonry Wall Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.S5.

The staff noted that the Masonry Wall Program includes the guidance and lessons learned from Office of Inspection and Enforcement Bulletin 80-11 and Information Notice 87-67.

During the audit and review, the staff asked for the visual examination frequency for the program and its technical basis.

In its response, the applicant stated that Maintenance Rule visual inspections are at least every five years to ensure no loss of intended function between inspections. The absence of operating experience with significantly degraded masonry walls indicates that this frequency is appropriate. The applicant also stated that no additional masonry walls have been added to the scope of this program, which, including visual examination frequencies, is consistent with GALL AMP XI.S5.

The staff reviewed the Masonry Wall Program portions for which the applicant claims consistency with GALL AMP XI.S5 and finds them consistent. The staff finds the applicant's Masonry Wall Program consistent with recommended GALL AMP XI.S5, "Masonry Wall Program," and acceptable.

Operating Experience. LRA Section B.1.27.1 states that inspections in 2000 revealed that each of the two block walls separating the emergency diesel generator (EDG) rooms was separated slightly at the ends where they connect to the reinforced concrete walls. Inspections in 2004 detected cracks at interfaces with doors, in the west block wall of the east electric bay and in the main control room inner vestibule masonry block wall. The cracks did not affect the structural integrity of the walls and were repaired with new grout. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing cracking of masonry walls and masonry wall joints. A QA surveillance in August 2003 revealed no issues or findings with impact on program effectiveness.

The staff reviewed the operating experience reports and also interviewed the applicant's technical personnel to confirm that plant operating experience revealed no degradation not bounded by industry experience.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concluded that the applicant's Masonry Wall Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.29, the applicant provided the UFSAR supplement for the Masonry Wall Program. The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Masonry Wall Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program,

as required by 10 CFR 54.21(d).

3.0.3.1.9 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program

Summary of Technical Information in the Application. LRA Section B.1.28 describes the new Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program as consistent with GALL AMP XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel."

The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program assures that reduction of fracture toughness due to thermal aging and radiation embrittlement will not cause loss of intended function. This program will evaluate cast austenitic stainless steel components in the reactor vessel internals and require nondestructive examinations as appropriate. EPRI, the BWR Owners Group, and other industry groups are focused on reactor vessel internals for a better understanding of aging effects. Future Boiling Water Reactor Vessel Internals Project (BWRVIP) reports, EPRI reports, and other industry operating experience will be additional bases for evaluations and inspections under this program. This program will supplement reactor vessel internals inspections required by the BWR Vessel Internals Program to assure that aging effects do not cause loss of reactor vessel internals intended functions during the period of extended operation. The program will be implemented fully prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.M13. The staff's review indicated that this program will include the criteria of GALL Report Chapter XI.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)."

Based on its review, the staff finds the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program consistent with recommended GALL AMP X.M13, "Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)," and acceptable.

Operating Experience. LRA Section B.1.28 states that the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program is a new program. Industry operating experience that forms the basis for the program is described in the operating experience element of the GALL Report program description. The applicant also states that plant-specific operating experience is consistent with the operating experience in the GALL Report program description.

During the audit and review, the staff asked for additional information on plant-specific operating experience with CASS components.

In its response, the applicant stated that it periodic examination of internal reactor vessel components has detected no degradation.

The staff also reviewed the operating experience in the basis document and interviewed the applicant's technical personnel to confirm that there is no industry operating experience with thermal aging and neutron irradiation embrittlement of CASS.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.31, the applicant provided the UFSAR supplement for the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that this program is Commitment No. 17 (JAFP-06-0109 dated July 31, 2006) to be implemented before the period of extended operation.

The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 17, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.1.10 Water Chemistry Control - BWR Program

Summary of Technical Information in the Application. LRA Section B.1.29.2 describes the existing Water Chemistry Control - BWR Program as consistent with GALL AMP XI.M2, "Water Chemistry."

The Water Chemistry Control - BWR Program manages aging effects caused by corrosion and cracking mechanisms. The program monitors and controls water chemistry based on EPRI Report 1008192 (BWRVIP-130), which has three sets of guidelines: one for primary water, one for condensate and feedwater, and one for control rod drive (CRD) mechanism cooling water. EPRI guidelines in BWRVIP-130 also include recommendations for controlling water chemistry in the torus, condensate storage tanks, demineralized water storage tanks, and the spent fuel pool. The Water Chemistry Control – BWR Program optimizes primary water chemistry to

minimize the potential for loss of material and cracking by limiting reactor coolant system levels of contaminants that could cause loss of material and cracking. Additionally, the applicant has instituted hydrogen water chemistry and noble metal chemical addition to limit the potential for intergranular stress corrosion cracking (IGSCC) through the reduction of dissolved oxygen in the treated water.

Staff Evaluation. During its audit and review, the staff reviewed the applicant's claim of consistency with the GALL Report.

The staff interviewed the applicant's technical personnel and reviewed the Water Chemistry Control - BWR Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.M2.

GALL AMP XI.M2, "Water Chemistry," recommends that water chemistry programs be based on the guidelines established in EPRI Report No. BWRVIP-29 or later versions of the report, such as EPRI Report Nos. BWRVIP-79 or BWRVIP-130. The applicant's Water Chemistry Program is based on conformance with the recommended water chemistry guidelines in EPRI Report No. BWRVIP-130. The staff determined that this is acceptable because the recommendations in EPRI Report No. BWVIP-130 are endorsed in GALL AMP XI.M2, "Water Chemistry," as an acceptable version of the report for implementation.

During the audit and review, the staff asked for information on other water chemistry activities (*e.g.*, hydrogen water chemistry).

In its response, the applicant stated that it had implemented hydrogen water chemistry in 1988 to mitigate cracking in the recirculation piping and noble metal chemical addition in 1999 and reapplied it in 2004. The applicant also instituted Zinc addition in 1989 for dose rate reduction.

The staff finds the applicant's Water Chemistry Control - BWR Program consistent with the recommended GALL AMP XI.M2 and acceptable.

Operating Experience. LRA Section B.1.29.2 states that from 2000 through 2004 there were several CRs of adverse trends in parameters monitored by the Water Chemistry Control - BWR Program. Corrective actions were taken within the corrective action program to preclude the parameters from reaching unacceptable values. In the same period, there were a few incidents in which parameters monitored by the Water Chemistry Control - BWR Program exceeded EPRI action Level 1 acceptance criteria. Monitoring frequency was increased and the parameters returned to the prescribed normal operating range as soon as possible (within the 96 hours permitted by action Level 1). In August 2003, reactor water sulfates were briefly above the EPRI action Level 2 acceptance criteria. Flow disturbance through the condensate demineralizers caused resin fines and flow channeling when restored to service. Corrective action was taken to remove condensate beds from service and clean them. In June 2004, while the Chemistry Department obtained a sample for analysis from the standby liquid control tank (11TK-1), several small particles were seen floating inside the tank. The next month's sample showed less particulate and later samples have shown none. Corrective actions included procedure modification to require sparge air sampling if particulate becomes evident again to determine whether this air could be the source of contamination. The Cycle 16 average chemistry data for primary and associated systems compares favorably when compared to the

action Level 1 parameter values from the BWR Water Chemistry Guidelines. Sulfate and chloride concentrations were very low, while average feedwater iron went up this cycle. Feedwater average iron and copper concentrations were affected by shutdowns and power reductions during the cycle along with reduced condensate temperatures and ultrasonic resin cleaning skid maintenance problems. Corrective actions were taken to repair and optimize the ultrasonic resin cleaning skid and additional improvements to the condensate demineralizer system have been pursued. A 2001 self-assessment revealed that sample system flow rates for the corrosion product metal samplers for feedwater and condensate may not be high enough for an adequate representative sample. The sample lines were replaced during the first quarter of 2004 with lines that deliver at least 6 linear feet/second. Continuous confirmation of water quality and timely corrective action prove that the program is effective in managing loss of material for applicable components. A QA surveillance in 2004 revealed no issues or findings with impact on program effectiveness.

The staff also reviewed operating experience reports and confirmed that plant-specific operating experience shows no effects of aging for systems and components within the scope of this program not bounded by industry operating experience. In plant-specific operating experience loss of material and cracking in components exposed to reactor water have been prevented. These effects of aging are consistent with industry operating experience, and this AMP includes aging management activities (*e.g.*, control of contaminant concentrations in reactor water) appropriate to prevent these effects of aging for reactor coolant pressure boundary components. The applicant further stated during the audit that corrective actions were taken prior to either a loss of component intended function or a deviation from normal contaminant level limits in the reactor water. The staff reviewed two CRs as examples of such activities and found that the applicant took appropriate corrective actions to remedy water chemistry contaminant level fluctuations.

Based on its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Water Chemistry Control - BWR Program will adequately manage the effects of aging for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.33, the applicant provided the UFSAR supplement for the Water Chemistry Control - BWR Program. The staff reviewed this section and determined that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

<u>Conclusion</u>. On the basis of its audit and review of the applicant's Water Chemistry Control - BWR Program, the staff finds all program elements consistent with the GALL Report. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2 AMPs Consistent with the GALL Report with Exceptions and/or Enhancements

LRA Appendix B, states that the following AMPs are, or will be, consistent with the GALL Report with exceptions or enhancements:

- Buried Piping and Tanks Inspection Program
- BWR CRD Return Line Nozzle Program
- BWR Feedwater Nozzle Program
- BWR Penetrations Program
- BWR Stress Corrosion Cracking Program
- BWR Vessel ID Attachment Welds Program
- BWR Vessel Internals Program
- Diesel Fuel Monitoring Program
- External Surfaces Monitoring Program
- Fatigue Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Metal-Enclosed Bus Inspection Program
- Oil Analysis Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program
- Service Water Integrity Program
- Structures Monitoring Program
- Water Chemistry Control - Closed Cooling Water Program
- Bolting Integrity Program

For AMPs that the applicant claimed are consistent with the GALL Report, with exception(s) and/or enhancement(s), the staff performed an audit and review to confirm that those attributes or features of the program for which the applicant claimed consistency with the GALL Report were indeed consistent. The staff also reviewed the exception(s) and/or enhancement(s) to the GALL Report to determine whether they were acceptable and adequate. The results of the staff's audits and reviews are documented in the following sections.

3.0.3.2.1 Buried Piping and Tanks Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.1 describes the new Buried Piping and Tanks Inspection Program as consistent, with exception, with GALL AMP XI.M34, "Buried Piping and Tanks Inspection."

This program includes (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, copper alloy, gray cast iron, and stainless steel components. Preventive measures are in accordance with standard industry practice for maintaining external coatings and wrappings. Buried components are inspected when excavated during maintenance. If trending within the corrective action program identifies susceptible locations, the areas with a history of corrosion problems are evaluated for the need for additional inspection, alternate coating, or replacement. There will be a focused inspection within the first ten years of the period of extended operation unless an opportunistic inspection occurs within this ten-year period. This program will be

implemented fully prior to the period of extended operation.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical personnel and reviewed the Buried Piping and Tanks Inspection Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.M34.

In reviewing this AMP, the staff noted that LRA Section B.1.1 states that this program will include an opportunistic or focused inspection within the first ten years of the period of extended operation.

During the audit and review, the staff asked the applicant whether there will be an inspection during the ten-year period immediately prior to the period of extended operation, as recommended by the GALL Report.

In its response, the applicant stated that, if there is no opportunistic inspection during the ten-year period immediately prior to the period of extended operation, there will be a focused inspection. The applicant further stated it would modify the program basis document to clarify this point. By the end of its audit and review the staff verified that the applicant had revised the basis document to state that either focused or opportunistic inspection, will be performed during the ten-year period immediately prior to entering the period of extended operation, as recommended in the GALL Report. The staff finds the revision is consistent with the GALL Report recommendations and acceptable.

The staff finds the applicant's Buried Piping and Tanks Inspection Program acceptable because it is consistent with GALL AMP XI.M34, "Buried Piping and Tanks Inspection," with an exception:

Exception. The LRA states an exception to the GALL Report program element "detection of aging effects," specifically:

> Inspections via methods that allow assessment of pipe condition without excavation may be substituted for inspections requiring excavation solely for the purpose of inspection.

During the audit and review, the staff asked the applicant for additional details on its inspection methods, including selection process criteria, method qualification, inspection personnel training, and corrective actions.

In its response, the applicant stated that the inspection method will assess piping condition effectively without the threat in excavation of damage to the coating. The applicant anticipates that such methods will assess more extensive buried piping portions than would the method of excavation for visual inspections at a sampling of locations. The purpose of this exception is to allow the use of more effective state-of-the-art inspection techniques (*e.g.*, phased array UT) in lieu of piping excavation with the potential for damage to the piping and its coating. As an

example, phased array UT examination qualification would be through demonstration by ASME Code Section V guidelines and industry guidance. Personnel performing the examination would be trained to Level II in accordance with the applicant's nondestructive testing practice.

The staff determined that this exception will use new technologies with a lower risk of damage to the coatings on buried components while providing information on component condition equivalent to that provided by excavation. The applicant has stated that the technique it uses will be qualified by accepted industry guidance (*e.g.*, ASME or National Association of Corrosion Engineers) and performed by trained operators using current Entergy practices. The staff finds that these prerequisites assure inspection results adequate for the intended purpose. The proposed exception also eliminates the possibility of inadvertent damage during inspection to assess the component. On these bases, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.1 states that the Buried Piping and Tanks Inspection Program is a new program. Industry operating experience that forms the basis for the program is described in the operating experience element of the GALL Report program description. Plant-specific operating experience is consistent with the operating experience in the GALL Report program description and provides reasonable assurance that the Buried Piping and Tanks Inspection Program will manage the aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extend operation.

During the audit and review, the staff asked for additional details on plant-specific operating experience with buried components for each material-environment combination within the scope of license renewal.

In its response, the applicant stated that a search of CRs from the early 1990s to present found one report, related to buried piping and tanks, of a leak in the hydrogen supply buried piping between the storage facility and the turbine building. The applicant determined the root cause of the leak to be poor application of the protective coatings, not aging-related. The corrective action was to replace the degraded section of piping. In addition to this event, several fire protection system buried valves were excavated and none showed evidence of corrosion. The staff reviewed the CR and confirmed the applicant's claim that this event was not caused by age-related degradation of the coatings. The staff determined that this operating experience shows no aging mechanisms not bounded by industry operating experience.

The staff also reviewed operating experience reports and confirmed that plant-specific operating experience shows no aging effects for systems and components within the scope of this program not bounded by industry operating experience.

On the basis of its review of the operating experience and discussions with the applicant's technical personnel, the staff concludes that the applicant's Buried Piping and Tanks Inspection Program will adequately manage the aging effects for which the LRA credits this AMP.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.1, the applicant provided the UFSAR supplement for the Buried Piping and Tanks Inspection Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that this new program is Commitment No. 1 (JAFP-06-0109 dated July 31, 2006) to be implemented before the period of extended operation.

The staff reviewed this section and determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Buried Piping and Tanks Inspection Program, the staff finds those program elements for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications and finds that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 1, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.2 BWR CRD Return Line Nozzle Program

Summary of Technical Information in the Application. LRA Section B.1.2 describes the existing BWR CRD Return Line Nozzle Program as consistent, with exceptions and enhancement, with GALL AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle."

Under this program, the applicant has cut and capped the CRD return line nozzle to mitigate cracking and continues inservice inspections (ISIs) to monitor the effects of crack initiation and growth on the intended function of the CRD return line nozzle and cap. In 2000, a structural weld overlay was made over a crack in the CRD return line nozzle-to-cap weld. The nickel-based Alloy 52 weld metal used in the overlay is highly resistant to stress corrosion, which was determined to be the cause of the cracking.

Staff Evaluation. During its audit and review, the staff reviewed the exceptions and enhancement to determine whether the AMP, with the exceptions and enhancement, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical personnel and reviewed the BWR CRD Return Line Nozzle Program bases documents. Specifically, the staff reviewed the program elements and bases documents for consistency with GALL AMP XI.M6.

LRA Section B.1.2 states that the applicant has cut and capped the CRD return line nozzle to mitigate cracking.

During the audit and review, the staff asked for additional information on these activities.

In its response, the applicant stated that it had detected a through-wall weld defect in the three-inch CRD return piping upstream of the vessel penetration in 1983. Following

NUREG-0619 recommendations for corrective actions, during the 1985 refueling outage (RO 7) the applicant removed the nozzle safe end and thermal sleeve and then cut and capped the CRD return line nozzle (N9). The materials in both the cap (Inconel 600) and the weldment (Inconel 182) are susceptible to IGSCC; therefore, although this dissimilar weld (ASME Code Category B-F weld) weld is on a three-inch nozzle, the applicant inspects it under the IGSCC Program, which applies to piping equal to or greater than four inches. The applicant determined that inspection of this weld is important because its material is susceptible to IGSCC; therefore, it was included in the IGSCC Program.

The staff determined that since the CRD return line nozzle was capped in 1985 the subject weld has been inspected periodically by volumetric (UT) examinations under the IGSCC Program in lieu of the ASME Code-required surface examination for piping less than four-inch NPS. The staff finds this program acceptable because volumetric examination can and surface examination cannot detect cracks originating from inside the nozzle.

Further, the LRA states that in 2000, a structural weld overlay was installed over a crack in the CRD return line nozzle-to-cap weld.

During the audit and review, the staff asked for additional information on the installation.

In its response, the applicant stated that, since the nozzle was capped, inspections of this weld revealed no indications of degradation until the inspection in 2000 (RO 14) revealed an unacceptable flaw on the inside surface of the weld. After approval by the staff, the applicant repaired the nozzle weld by applying a weld overlay (nickel-based Alloy 52) rather than removing the crack by grinding as recommended in NUREG-0619. Results of a UT examination of the completed weld overlay were acceptable. The applicant continues the UT examinations of this weld under the IGSCC Program and will continue them during the period of extended operation.

Also in its response to the staff's question, the applicant also stated that numerous UT examinations of the nozzle blend radius prior to 2002 yielded no recordable or relevant indications of degradation. The applicant has inspected the CRD return line nozzle-to-vessel weld and the nozzle blend radius under the ISI Program in accordance with requirements of ASME Code Section XI, Table IWB-2500-1, Code Category B-D, Item Nos. B3.90 and B3.100. Additionally, the applicant has committed to continue enhanced visual examinations (EVT-1s) (½ mil resolution) of the CRD return line nozzle blend radius and adjacent vessel wall area during the fourth 10-year ISI interval as well as during the period of extended operation.

The staff finds the applicant's activities acceptable because the applicant appropriately followed NUREG-0619 recommendations by cutting and capping the CRD return line nozzle in 1985 and repaired the defect at the nozzle-to-cap weld with a structural weld overlay in 2000. Recent UT examination of the nozzle-to-cap weld overlay in 2004 revealed no indications of cracking. In addition, the EVT-1 visual inspection of the nozzle blend radius and adjacent vessel wall area in 2000 also revealed no cracking. Moreover, the applicant will continue ASME Code examinations of the nozzle, including EVT-1 visual examination of the nozzle blend radius area, during the period of extended operation.

The staff finds the applicant's BWR CRD Return Line Nozzle Program consistent with the recommended GALL AMP XI.M6, "BWR Control Rod Drive Return Line Nozzle," and acceptable with the following exceptions and enhancement:

Exception 1. The LRA states an exception to the GALL Report "scope" and "parameters monitored or inspected" program elements, specifically:

> The dissimilar weld between the CRDRL nozzle and end cap is not subject to ISI per ASME Section XI, Subsection IWB.

The footnote to this exception states:

> The dissimilar weld between the CRDRL nozzle and end cap is exempt from ISI examination requirements per IWB-1220(a). However, this weld is inspected by UT as part of the JAFNPP IGSCC program. JAFNPP also employs HWC and NMCA to mitigate the effects of IGSCC on the CRDRL nozzle.

The staff noted that, although the CRD return line meets ASME Code Section XI, IWB-1220(a) requirements for exclusion from volumetric and surface examination, the applicant has conducted volumetric UT examinations of the CRD return line nozzle-to-cap weld under its IGSCC Inspection Program. The applicant initiated these inspections when it implemented NUREG-0619 recommendations during the 1985 refueling outage. Inspections were scheduled in accordance with BWRVIP-62 and BWRVIP-75-A. In 2000, UT examination of the weld revealed a defect on its inside wall and, after repairing the weld with a nickel-based Alloy 52 weld overlay, the applicant appropriately re-categorized the weld based on BWRVIP-75-A from Category D to Category E. The staff verified that this weld is appropriately in the IGSCC Program and that the nickel-based Alloy 52 in the weld overlay is resistant to IGSCC. The staff also determined that the applicant employs hydrogen water chemistry (HWC) and noble metal chemical addition (NMCA) to mitigate IGSCC effects. The staff finds that the applicant's periodic inspection of the CRD return line nozzle-to-cap weld will detect any future defects in the weld promptly. This inspection, along with the other activities to mitigate IGSCC, reasonably assure maintenance of the structural and pressure boundary integrity of the reactor pressure vessel (RPV) with the capped nozzle (N9) during the period of extended operation. On this basis, the staff finds this exception acceptable.

Exception 2. The LRA states an exception to the GALL Report "preventive actions" program element, specifically:

> The flow capacity test required by NUREG-0619 was not performed prior to capping the CRDRL nozzle.

The footnote to this exception states:

> JAFNPP was granted an exemption from the requirement to perform a CRD return flow capacity test per NUREG-0619 through an NRC letter (letter dated August 25, 1983, from D. B. Vassallo [NRC] to J. P. Bayne [NYPA]) issued before the CRDRL modification was made. JAFNPP is not required to perform the flow capacity test, and successful system operation for more than 20 years

since the modification has confirmed proper return flow capability.

The staff reviewed the applicant's CRD return line modifications (JPN-83-64, CRD Return Line Modifications (NUREG-0619), July 7, 1983) in response to NUREG-0619 and the associated SER, and determined that the applicant had isolated the CRD return line in 1977 and demonstrated satisfactory operation of the CRD system by a two-CRD pump capability test. This test demonstrated that the flow rate of the isolated CRD return line was sufficient to heat the vessel to normal pressure and temperature followed by a reactor scram as designed. When the applicant requested approval to cap the CRD return line nozzle in 1983, the staff granted an exemption from the flow capacity test required by NUREG-0619. As this test was not required during the current period of operation, the staff finds it also not required during the period of extended operation. On this basis, the staff finds this exception acceptable.

Exception 3. The LRA states an exception to the GALL Report "detection of aging effects" and "monitoring and trending" program elements, specifically:

> The extent and schedule of inspection, as delineated in NUREG-0619, are not followed. Specifically, liquid penetrant testing (PT) of CRDRL nozzle blend radius, adjacent wall area and bore regions is not performed.

The footnote to this exception states:

> JAFNPP performs EVT-1 visual examinations (½ mil resolution) of the CRDRL nozzle blend radius and adjacent wall area every 10 years in lieu of PT examinations. The weld overlay installed over a crack in the CRD return line nozzle-to-cap weld covers the nozzle, the nozzle-to-cap weld, and part of the cap. The nickel-based Alloy 52 weld overlay, which is highly resistant to stress corrosion cracking, is ultrasonically inspected in accordance with GL 88-01 and BWRVIP-75-A. The weld overlay provides reasonable assurance of structural and pressure boundary integrity of the RPV capped N9 nozzle and thus provides an acceptable level of quality and safety. Since the nozzle and original nozzle-to-cap weld are covered by the overlay, and the overlay is examined, examination of the nozzle and original nozzle-to-cap weld is not required.

The applicant's program basis document states that numerous UT examinations of the CRD return line nozzle blend radius prior to 2002 yielded no recordable or relevant indications. Enhanced visual examination (½ mil resolution) of the nozzle blend radius and adjacent vessel wall area in 2000 also revealed no cracking. The applicant will continue its ISI, including the EVT-1 visual examination, of the CRD return line nozzle blend radius and adjacent wall area every ten years in lieu of penetrant testing (PT) examinations recommended in NUREG-0619.

The applicant's program basis document further states that the weld overlay installed over a crack in the CRD return line nozzle-to-cap weld covers the nozzle, the nozzle-to-cap weld, and part of the cap. The nickel-based Alloy 52 weld overlay is inspected ultrasonically under the IGSCC Program. As the nozzle and original nozzle-to-cap weld are covered by the overlay, and the overlay is examined, the applicant claimed that the examination of the nozzle and original nozzle-to-cap weld is not required; however, the staff determined that the repair method for this weld overlay (*i.e.*, Code Case N-504-1(g)(2)) requires a design life for the weld. The applicant

has not demonstrated that the design life of the original nozzle-to-cap weld includes the period of extended operation.

Although the aging management of the nozzle-to-cap weld and its overlay is acceptable, during the audit and review the staff asked the applicant to justify not calculating (as a TLAA) the design life of the original cracked weld.

In its response, the applicant stated that the modification required no such calculation for the current operating term; moreover, weld overlays of this type maintain the original flaw in compression and the qualifying evaluations assumed through-wall flaw growth to 360 degrees. The staff determined that, as long as the structural integrity of the weld overlay maintains the compressive load on it, the original weld flaw would not grow. The compressive force will confine the flaw in its place. Moreover, periodic UT examination of the weld overlay verifies and maintains its structural integrity during the period of extended operation; therefore, the weld overlay reasonably assures the structural and pressure boundary integrity of the RPV capped N9 nozzle.

Based on the above review, the staff determined that the current CRD Return Line Nozzle Program, which includes IGSCC and NUREG-0619 requirements, reasonably assures maintenance of the structural and pressure boundary integrity of the RPV with the capped CRD return line nozzle; therefore, the staff determined that liquid PT of the CRD return line nozzle blend radius, adjacent wall area, and bore regions is not required. On this basis, the staff finds this exception acceptable.

Exception 4. The LRA states an exception to the GALL Report “acceptance criteria” program element, specifically:

> JAFNPP repaired the CRDRL nozzle by weld overlay rather than removing the crack by grinding and examines the overlay using UT in lieu of RT.

The footnote to this exception states:

> In its letter of October 26, 2000, the NRC concluded that the proposed alternative provides reasonable assurance of structural and pressure boundary integrity of the RPV capped N9 nozzle and thus provides an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(I), the NRC staff authorized use of ASME Code Case N-504-1.

Based on the NRC letter dated October 26, 2000, the staff determined that use of a weld overlay to repair the flawed RPV nozzle (N9) to the CRD return line cap weld was acceptable. The staff determined that the initiation of the defect from the inside surface of the nozzle made the code repair, which requires the removal of the defects from the flawed component by grinding, impractical. Moreover, by use of a weld overlay, the repair could be completed without draining the water from the reactor vessel and removing fuel from the core; therefore, at that time, the staff approved the applicant’s proposed repair of the flawed RPV nozzle (N9) to the CRD return line cap weld by use of an overlay in accordance with ASME Code Cases N-504-1 and N-638 as an alternative to ASME Code Section XI, IWB-4000 repair requirements. ASME Code Case N-504-1 applies to austenitic weld overlays using Alloy 52 or Alloy 152 for local

repair. ASME Code Case N-638 applies to the use of an ambient temperature temper bead welding technique.

The staff noted that the applicant examined the repaired weld by UT instead of a radiographic test to verify the integrity of the newly-applied weld reinforcement. The applicant will continue the UT examination of the weld overlay under the IGSCC Program. The staff finds UT acceptable as a volumetric examination appropriate for this type of weld. The UT examinations will detect any weld flaws prior to the loss of any component intended function. The staff also finds that the repair of the CRD return line nozzle-to-cap weld has been approved previously and is an appropriate repair technique for this type of weld flaw. The repair reasonably assures maintenance of RPV structural and pressure boundary integrity with the capped N9 nozzle. On this basis, the staff finds this exception acceptable.

Enhancement. The LRA states an enhancement to the GALL Report “scope of program” and “parameters monitored or inspected” program elements, specifically:

> The CRD Return Line Nozzle Program will be enhanced to examine the CRDRL nozzle-to-vessel weld and the CRDRL nozzle inside radius section per section XI Table IWB-2500-1 category B-D items B3.10 and B3.20.

During the audit and review, the staff noted that, in accordance with ASME Code Section XI, Table IWB-2500-1, Code Category B-D, Item Nos. B3.90 and B3.100 (JAFNPP is an Inspection Program B plant), the CRD return line nozzle-to-vessel weld and nozzle inside radius section must have a volumetric examination during each ten-year ISI interval. The staff noted that the LRA erroneously identifies these as Items B3.10 and B3.20, which are applicable for a Program A plant.

In its response dated February 1, 2007, the applicant amended LRA Section B.1.2 to state, "Enhance the BWR CRD Return Line Nozzle Program to examine the CRDRL nozzle-to-vessel weld and the CRDRL nozzle inside radius section per Section XI Table IWB-2500-1 Category B-D Items B3.90 and B3.100" (Commitment No. 2) (JAFP-06-0109, dated July 31, 2006).

The staff also noted that inspection of the CRD return line nozzle-to-vessel weld and nozzle inside radius section are ASME Code-required UT examinations (augmented by an EVT-1 examination in lieu of PT recommended in NUREG-0619) and asked the applicant, during the audit and review, to explain why this inspection is an enhancement. The applicant explained that at the time the LRA was written these inspections were not scheduled during the current third ten-year ISI interval; however, the applicant later confirmed that these inspections have been completed for the third ten-year ISI interval. The applicant also confirmed that it has completed these inspections during the first and second ten-year ISI intervals and will continue them during the fourth as well as during the period of extended operation.

The staff determined that the applicant meets ASME Code requirements for inspection of the CRD return line nozzle-to-vessel weld and the CRD return line nozzle inside radius section and will continue to meet them for the period of extended operation. On this basis, the staff finds this enhancement acceptable.

Operating Experience. LRA Section B.1.2 states that on October 15, 2000, examination revealed cracking of the CRD return line nozzle-to-cap weld. The probable cause was IGSCC of the cap's susceptible base material (Inconel 600) and weld metal (Inconel 82/182). A structural weld overlay was made with Inconel 52 weld metal, which is highly resistant to stress corrosion cracking. The weld overlay process also imparts a compressive residual stress which prevents further crack growth. The N9 nozzle-to-cap weld overlay received all code-required preservice nondestructive examinations and was pressure-tested prior to service. Ultrasonic examination of the nozzle-to-cap weld overlay in RO16 (2004) revealed no indications of cracking. Enhanced visual examination (½ mil resolution) of the nozzle blend radius and adjacent vessel wall area in 2000 also revealed no cracking. As the weld overlay is highly resistant to cracking and no indications of cracking have been observed, the BWR CRD Return Line Nozzle Program remains effective for managing the effect of cracking on the intended function of the CRD return line nozzle. A self-assessment in 2004 revealed no issues or findings with impact on program effectiveness.

The staff reviewed past inspection results of the CRD return line nozzle since JAFNPP implemented NUREG-0619 recommendations and confirmed that the results revealed no indications of cracking in the nozzle-to-vessel and nozzle blend radius area. This is due to the fact that the subject nozzle operated for only two years with the CRD return line in operation before isolating it in 1977. In addition, the nozzle originally included a thermal sleeve which protected the nozzle blend radius area.

The staff determined that JAFNPP cut and capped the CRD return line with an Inconel 600 cap in 1985 and since then the dissimilar weld between the nozzle-to-cap was inspected as part of the IGSCC Program. The inspections revealed no indications until 2000 when JAFNPP detected a defect in the inside diameter of the weld due to IGSCC caused by the stagnant reactor water within the capped nozzle. The applicant repaired the nozzle using a weld overlay. Since then the inspections of the weld revealed no indications of cracking.

The staff interviewed the applicant's technical staff and reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any effects of aging for systems and components within the scope of this program that are not bounded by industry operating experience. The JAFNPP operating experience included detection of cracking in the nozzle blend radius, the nozzle-to-vessel weld and the nozzle-to-cap weld. This effect of aging is consistent with industry operating experience, and this AMP includes aging management activities, such as UT and visual inspections that appropriately detect cracking. Corrective actions were taken in accordance with the Plant Corrective Action Program prior to a loss of intended function of the component.

Based on its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's BWR CRD Return Line Nozzle Program will adequately manage the effects of aging identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.2, the applicant provided the UFSAR supplement for the BWR CRD Return Line Nozzle Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the enhancement for this program is identified as Commitment No. 2, which will be implemented before the period of extended operation.

The staff determines that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR CRD Return Line Nozzle Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and associated justifications and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancement and confirmed that the implementation of the enhancement prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.3 BWR Feedwater Nozzle Program

Summary of Technical Information in the Application. LRA Section B.1.3 describes the existing BWR Feedwater Nozzle Program as consistent, with exception, with GALL AMP XI.M5, "BWR Feedwater Nozzle."

Under this program, the applicant has removed all identified feedwater blend radii flaws, removed feedwater nozzle cladding, and installed a double piston ring and triple thermal sleeve sparger to mitigate cracking. This program implements enhanced ISI of the feedwater nozzles in accordance with ASME Section XI, Subsection IWB and the recommendation of General Electric NE-523-A71-0594 to monitor the effects of cracking on the intended function of the feedwater nozzles.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the BWR Feedwater Nozzle Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M5.

LRA Section B.1.3 states that the applicant has removed all identified feedwater blend radii flaws, removed feedwater nozzle cladding, and installed a double piston ring and triple thermal sleeve sparger to mitigate cracking.

During the audit and review, the staff asked the applicant for additional information on the activities performed to address the industry-wide feedwater nozzle cracking issues documented in NUREG-0619.

In its response, the applicant stated that, although there were no indications noted during the feedwater nozzle modification, JAFNPP removed stainless steel cladding at the feedwater nozzle areas and installed the triple thermal sleeve and double piston-ring seal spargers to meet the NUREG-0619 recommendations. The applicant also stated that the reference in LRA Section B.1.3 to “removed all identified feedwater blend radii flaws” is not accurate since no indications were noted during the nozzle modification.

In its letter dated February 1, 2007 (LRA Amendment 5), the applicant revised the LRA by deleting “removed all identified feedwater blend radii flaws” from the program description section of LRA Section B.1.30.

JAFNPP did not install new low-flow feedwater controllers or reroute the reactor water clean-up (RWCU) system return flow at the time of feedwater nozzle modification. Re-routing of the RWCU return flow to all feedwater lines is recommended in NUREG-0619 to improve system performance and reduce temperature fluctuations at the nozzle bend areas during low-power operation. Since then, inspections of the feedwater nozzle blend radius area have been performed at every inspection interval in accordance with NUREG-0619 and General Electric (GE) document NE-523-A71-0594 with no relevant and/or reportable indications.

The applicant also stated that the current JAFNPP Enhanced Inservice Inspection Program, which addresses the augmented inspections in accordance NUREG-0619 and GE document NE-523-A71-0594-A (Revision 1), expand the inner radius examination volume identified by ASME Code Section XI to the nozzle outside diameter (OD) taper area. The staff also verified that the last examination completed in 2002 using phased array automated techniques (Wesdyne) revealed no indications in the feedwater nozzle inner radius area.

During the audit and review, the staff also asked the applicant to discuss how bypass flow around the feedwater nozzle thermal sleeve is monitored, since this could occur due to a degraded thermal sleeve seal.

In its response, the applicant stated that in the early nineties, JAFNPP eliminated the need to perform a liquid penetrant test examination of the feedwater nozzles, as recommended by NUREG-0619, and at the same time committed to utilize a leakage monitoring system (LMS) to monitor bypass flow across the thermal sleeve seal. However, in the third ten-year ISI period on February 18, 1999 (JPN-99-003, Commitment Change - Feedwater Nozzle Leakage Monitoring System, February 18, 1999), the applicant submitted to the staff a commitment change request to discontinue the use of the LMS to monitor the bypass flow. The applicant provided the technical basis for this commitment change, which stated that the temperature data from the LMS had confirmed the effectiveness of the changes made to limit feedwater bypass flow. The feedwater LMS, originally installed in 1992, measured the temperatures of the outside surface of the feedwater nozzles downstream of the thermal sleeve seals. These temperatures were then correlated to the secondary seal bypass leakage.

The applicant further stated that based on the evaluation of LMS data, secondary seal bypass leakage was acceptable and no increasing trend had been exhibited by any of the four feedwater nozzles. Moreover, the applicant is performing the feedwater nozzle examinations as part of the Inservice Inspection Program, which includes augmented inspection activities per GE-NE-523-A71-0594A. The staff found this acceptable, since the applicant has demonstrated that the present feedwater nozzle triple thermal sleeves do not exhibit any bypass leakage and the periodic inspection of the nozzle inner radius would ensure timely detection of any developing defects in the nozzle blend radius area.

The staff found the applicant's activities acceptable, since the applicant appropriately followed NUREG-0619 recommendations by removing clad material from the nozzle area and installed an improved thermal sleeve sparger. Since then, UT examination of the feedwater nozzles revealed no indications of cracking. Moreover, the applicant will continue Code inspections, including augmented inspections per GE document NE-523-A71-0594-A and an expanded inner radius examination volume to the nozzle OD taper area, during the period of extended operation.

The staff finds the applicant's BWR Feedwater Nozzle Program acceptable because it conforms with the recommended GALL AMP XI.M5, "BWR Feedwater Nozzle" Program with the exception as described:

Exception. The LRA states an exception to the GALL Report program element "preventive actions." Specifically, the exception states:

> The reactor water cleanup system was not rerouted and a low flow controller meeting all requirements of NEDO-21821-A was not installed.

The associated note to this exception states:

> In its safety evaluation of JAFNPP actions taken to address feedwater nozzle cracking, the NRC noted that the intent of the requirements of NUREG-0619 and NEDO21821-A had been satisfied with the JAFNPP modifications. Since the stainless steel cladding has been removed, the improved spargers have been installed and the control rod drive return line has been cut and capped, an adequate margin of safety against feedwater nozzle crack growth exists. Therefore, NRC concluded that, with continued inspections to monitor for crack initiation and growth, JAFNPP can operate without rerouting the RWCU and without installing a low-flow controller for the feedwater system. Since inspections to monitor for crack initiation and growth will continue per ASME Section XI, this conclusion remains valid for the period of extended operation.

The staff finds this exception acceptable since the current JAFNPP BWR Feedwater Nozzle Program includes recommendations in NUREG-0619, with the exception that the applicant has not installed low-flow controllers or re-routed the RWCU return lines to the feedwater system. This exception has been approved by the staff and is the CLB for JAFNPP. Also, since inspections to monitor for crack initiation and growth will continue per ASME Code Section XI, this conclusion remains valid for the period of extended operation.

Operating Experience. LRA Section B.1.3 states that ultrasonic testing of the feedwater nozzles during RO15 (2002) recorded no indications. Absence of recordable indications on the feedwater nozzles proves that the program is effective for managing nozzle cracking. As stated in GALL Report Section XI.M5, “The present AMP has been implemented for nearly 20 years and found to be effective in managing the effect of cracking on the intended function of feedwater nozzles.” Recent inspections recorded no indications, thus the program is effective in managing the effect of cracking on the intended function of the feedwater nozzles. A self-assessment in 2004 revealed no issues or findings with impact on program effectiveness.

The staff reviewed past inspection results of the feedwater nozzle and determined that the initial PT examinations followed by the UT examination of the nozzle area during later years revealed no indications in the feedwater nozzle inner radius area at JAFNPP. There were no reportable defects in its feedwater nozzles when JAFNPP implemented NUREG-0619 recommendations. The staff also verified that the last examination completed in 2002 using phased array automated techniques (Wesdyne) revealed no indications in the feedwater nozzle inner radius area. The staff reviewed the 2004 self-assessment report which revealed no issues or findings with impact on the effectiveness of this program.

The staff interviewed the technical staff and also reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any effects of aging for systems and components within the scope of this program that are not bounded by industry operating experience. This effect of aging is consistent with industry operating experience, and this AMP includes aging management activities, such as UT examination, appropriate to detect cracking. Corrective actions were taken in accordance with the Plant Corrective Action Program prior to a loss of intended function of the component.

Based on its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s BWR Feedwater Nozzle Program will adequately manage the effects of aging identified in the LRA for which this AMP is credited.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.3, the applicant provided the UFSAR supplement for the BWR Feedwater Nozzle Program. The staff reviewed this section and determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant’s BWR Feedwater Nozzle Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by

10 CFR 54.21(d).

3.0.3.2.4 BWR Penetrations Program

Summary of Technical Information in the Application. LRA Section B.1.4 describes the existing BWR Penetrations Program as consistent, with exception, with GALL AMP XI.M8, "BWR Penetrations Program."

The program includes: (a) inspection and flaw evaluation in accordance with the guidelines of staff-approved boiling water reactor vessel and internals project (BWRVIP) documents BWRVIP-27-A and BWRVIP-49-A and (b) monitoring and control of reactor coolant water chemistry in accordance with BWRVIP-130 guidelines to ensure the long-term integrity of vessel penetrations and nozzles.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the BWR Penetrations Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M8.

The applicant stated that for the JAFNPP instrument penetration configuration, BWRVIP-49-A recommended no additional inspections beyond those required by ASME Code Section XI, Subsection IWB-2500. JAFNPP performs ISIs to monitor the effects of cracking on the intended function of the instrument penetrations in accordance with ASME Code Section XI, Subsection IWB. Visual VT-2 inspections of instrument nozzle partial penetration and nozzle-to-extension welds are performed during system pressure testing (Code Item B4.13). The nozzle forging and the nozzle inner radius are exempt from volumetric examination in accordance with ASME Code Section XI, Subsection IWB-1220(c).

The applicant also stated that for the JAFNPP standby liquid control (SLC) nozzle configuration, BWRVIP-27-A recommends, in addition to the requirements of ASME Code Section XI, Subsection IWB, a volumetric examination of the nozzle-to-safe-end connection weld be performed every 10 years, as soon as a method for conducting that examination is developed. In accordance with this BWRVIP-27-A recommendation, JAFNPP performs an enhanced visual leakage VT-2 inspection (with direct view of the component during pressure test) every outage and a surface examination every 10 years. This will be continued until a volumetric inspection technique is developed. Once an acceptable volumetric examination is developed, it will be performed each 10 year ISI interval in conjunction with continued visual inspections each outage. JAFNPP performs ISIs to monitor the effects of cracking on the intended function of the SLC/deltaP (ΔP) penetration in accordance with ASME Code Section XI, Subsection IWB, during system pressure testing.

The staff noted that LRA action Item 4 in BWRVIP-27-A states that due to the susceptibility of SLC/ΔP penetrations to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue. In LRA Appendix C, the applicant stated that this fatigue analysis is

required only for the low-alloy steel nozzle designs. The applicant further stated that the JAFNPP SLC/ΔP nozzle is an SB-166 nickel-based alloy insert; therefore, this action item is not applicable to JAFNPP.

The staff reviewed the BWRVIP recommendations associated with this program and determined that the applicant's activities are consistent with these recommendations. The staff also determined that the applicant's program provides timely detection of any defects in the instrument and SLC/ΔP nozzle penetrations. Based on this, the staff finds the applicant's activities acceptable.

The staff finds the applicant's BWR Penetrations Program acceptable because it is consistent with the recommended GALL AMP XI.M8, "BWR Penetrations Program," with the exception as described:

Exception. The LRA states an exception to the GALL Report program elements "parameters monitored/inspected," and "detection of aging effects." Specifically, the exception states:

> Table IWB-2500-1 from the 1989 edition of ASME Section XI is used, while NUREG-1801 specifies the 2001 edition with 2002 and 2003 addenda.

The associated note to this exception states:

> Since ASME Section XI editions through the 2003 Addenda have been accepted by reference in 10CFR50.55a(b) (2) without modification or limitation on use of Table IWB-2500-1 from the 1989 edition for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation.

As indicated in LRA Amendment No. 5 dated February 1, 2007, the 4th 10-Year ISI Interval for JAFNPP will be the 10-Year ISI interval in effect if the LRA is approved by the staff. The applicant's amendment of the LRA is in compliance with the requirements of 10 CFR 50.55a because the applicant was required by paragraph (b) of the rule to update in Section XI edition of reference to 2001 Edition of Section XI (inclusive of the 2003 Addenda), one year prior to entering the 4th 10-Year ISI Interval for JAFNPP. Based on this assessment, the staff concludes that the changes to the LRA are acceptable because they are in compliance with the requirements of 10 CFR 50.55a and in conformance (i.e., consistent) with the "scope of program" element in GALL AMP XI.M8, "BWR Penetrations."

The staff evaluated this exception as part of its review of the Inservice Inspection Program and finds it acceptable, since it is consistent with the requirements of 10 CFR 50.55a. The staff's evaluation is discussed in SER Section 3.0.3.3.3.

Operating Experience. LRA Section B.1.4 states that visual examination of the standby liquid control nozzle during the reactor vessel system leakage tests in the last three outages (2000, 2002, and 2004) recorded no indications or leakage. Visual examination of the instrument penetration nozzles during the reactor vessel system leakage tests in the last three outages (2000, 2002, and 2004) recorded no indications or leakage. Absence of recordable indications

on the standby liquid control and instrument penetration nozzles proves that the program is effective for managing cracking of the nozzles. Self-assessments in 2004 and 2005 revealed no issues or findings that would impact program effectiveness.

The staff also reviewed the operating experience reports and confirmed that the plant-specific operating experience did not include any effects of aging for systems and components within the scope of this program that are not bounded by industry operating experience. The JAFNPP operating experience included detection of cracking in the SLC/ΔP nozzle (N10) and instrument nozzles (N11, N12 and N16). This effect of aging is consistent with industry operating experience, and this AMP includes aging management activities, such as visual inspections and surface examinations appropriate to detect cracking. The staff found no indications or leakage during pressure testing in the past inspections (2000, 2002, and 2004) and found the program effective in mitigating any cracking prior to a loss of intended function of these nozzles.

Based on its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s BWR Penetrations Program will adequately manage the effects of aging identified in the LRA for which this AMP is credited.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.4, the applicant provided the UFSAR supplement for the BWR Penetrations Program. The staff determines that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant’s BWR Penetrations Program, the staff finds that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.5 BWR Stress Corrosion Cracking Program

Summary of Technical Information in the Application. LRA Section B.1.5 describes the existing BWR Stress Corrosion Cracking Program as consistent, with exception, with GALL AMP XI.M7, “BWR Stress Corrosion Cracking Program.”

The program includes: (a) preventive measures to mitigate IGSCC and (b) inspection and flaw evaluation to monitor IGSCC and its effects on reactor coolant pressure boundary components made of stainless steel or cast austenitic stainless steel. The applicant has taken actions to prevent IGSCC and will continue to use materials resistant to IGSCC for component

replacements and repairs following the recommendations of NUREG-0313, Generic Letter (GL) 88-01, and the staff-approved BWRVIP-75-A report. Inspection of piping identified in GL 88-01 to detect and measure cracks is in accordance with the staff positions on schedule, method, personnel qualification, and sample expansion included in the generic letter and the staff-approved BWRVIP-75-A report.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the BWR Stress Corrosion Cracking Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M7.

The applicant stated that the BWR Stress Corrosion Cracking Program will be implemented in accordance with BWRVIP-75-A guidelines for "parameters monitored/inspected," "detection of aging effects," "monitoring and trending," and "acceptance criteria." The BWRVIP guidelines require an expanded inspection scope, and re-inspection if flaws are detected.

During the audit and review, the staff asked the applicant for additional information on all weld repairs and material replacement of components that occurred when implementing NUREG-0313 and GL 88-01 recommendations.

In its response, the applicant stated that the following piping was replaced with IGSCC resistant material (low carbon stainless steel): (a) the core spray piping from the RPV nozzle on B-loop to the first isolation valve was replaced with 347NG in 1992, and (b) the core spray A-loop was replaced from the safe-end to the isolation valve with 316L. All other IGSCC welds were repaired using weld overlays. Pipe specification Class 1504 was modified for future procurement to restrict carbon content to 0.035% maximum, ferrite to 8% minimum in weld metal and to require solution annealing.

The applicant further stated in their response that the overlays were installed and designed in accordance with GL 88-01, NUREG-0313, Revision 2, and ASME Code requirements. The post-weld overlay examinations performed on these welds revealed no reportable and/or unacceptable indications. The staff verified that the applicant has fully implemented the GL 88-01 and NUREG-0313 guidelines and has been inspecting the relevant piping in accordance with NRC-approved BWRVIP-75-A, since the BWR Stress Corrosion Cracking Program was first implemented.

The staff found that the applicant appropriately mitigated IGSCC in systems and components by implementing the requirements of GL 88-01, NUREG-0313 and BWRVIP-75-A, and is following the requirements of the ASME Code version currently applicable to JAFNPP. Since the BWRVIP guidelines for reactor vessel internal components requires an expanded inspection scope and re-inspection if flaws are detected, the added requirements provide additional assurance that the inspection program offers timely detection of future defects. On this basis, the staff finds this planned modification acceptable.

The staff finds the applicant’s BWR Stress Corrosion Cracking Program acceptable because it

is consistent with the recommended GALL AMP XI.M7, “BWR Stress Corrosion Cracking Program,” with the exception as described below.

Exception. The LRA states an exception to the GALL Report program element “acceptance criteria.” Specifically, the exception states:

> The 1989 edition of ASME Section XI is used for flaw evaluation, while NUREG-1801 specifies the 1986 edition.

The associated note to this exception states:

> ASME Section XI 1989 edition has been accepted by the NRC in 10 CFR 50.55a(b)(2) without modification or limitation on use of this edition for flaw evaluation. Thus, components crediting this program can be expected to perform their intended function consistent with the current licensing basis during the period of extended operation.

As indicated in LRA Amendment No. 5 dated February 1, 2007, the 4th 10-Year ISI Interval for JAFNPP will be the 10-Year ISI interval in effect if the LRA is approved by the staff. The applicant's amendment of the LRA is in compliance with the requirements of 10 CFR 50.55a because the applicant was required by paragraph (b) of the rule to update in Section XI edition of reference to 2001 Edition of Section XI (inclusive of the 2003 Addenda), one year prior to entering the 4th 10-Year ISI Interval for JAFNPP. Based on this assessment, the staff concludes that the changes to the LRA are acceptable because they are in compliance with the requirements of 10 CFR 50.55a and in conformance (i.e., consistent) with the “scope of program” element in GALL AMP XI.M7, “BWR Stress Corrosion Cracking.”

The staff evaluated this exception as part of its review of the Inservice Inspection Program, and finds it acceptable, since it is consistent with the requirements of 10 CFR 50.55a. The staff’s evaluation is discussed in SER Section 3.0.3.3.3.

Operating Experience. LRA Section B.1.5 states that ultrasonic examinations of four recirculation nozzle safe-end welds, three jet pump instrumentation nozzle safe-end welds, seven recirculation system piping welds, and three residual heat removal (RHR) system piping welds during RO15 (2002) recorded six indications attributed to geometric conditions and not cracks. Ultrasonic examinations of the CRD nozzle-to-cap weld overlay and three recirculation system piping welds during RO16 (2004) recorded one indication attributed to geometric conditions and not a crack. Absence of cracks on the nozzle and piping welds proves that the program is effective for managing cracking of austenitic stainless steel components.

In LRA Section B.1.5, the applicant stated that UT examination of four recirculation nozzle safe-end welds, three jet pump instrumentation nozzle safe-end welds, seven recirculation system piping welds, and three RHR system piping welds during RO 15 (2002) resulted in six indications attributed to geometric conditions and not cracks.

During the audit and review, the staff asked the applicant to clarify these recently recorded six indications attributed to geometry.

In its response, the applicant stated that performance demonstration initiatives (PDI)s personnel performed the examinations in accordance with Washington Group procedure JAF-UT-89-1, "Manual Ultrasonic Examination Austenitic and Dissimilar Metal Piping Welds," Revision 0. The examinations adopted the PDI requirements of ASME Code Procedure PDI-UT-2 (at the time) for piping welds, as required by 10 CFR 50.55a. The examinations identified geometry which required recording to comply with JAF-UT-89-1 procedures. The root and counterbore geometry identified was recorded and evaluated by the examiner consistent with procedural requirements and techniques developed during the PDI. PDI procedures provide guidance for the evaluation of indications observed during examinations. The evaluation criterion is applied by PDI qualified examiners as necessary indication evaluation and varies depending upon the examination and circumstances encountered. The applicant also stated that the discussion in the LRA with regard to the number of welds inspected is incorrect and will be corrected.

In its letter dated February 1, 2007 (LRA Amendment 5), the applicant revised LRA Section B.1.5 to state:

> The operating experience section is revised to state as follows: 'Ultrasonic examination of four recirculation nozzle safe-end welds, one jet pump instrumentation nozzle safe-end weld and two piping welds (Note that N8-SE-1 and N8-SE-3 welds are piping welds despite nomenclature), seven recirculation system piping welds, and five RHR system piping welds.'

The staff found that the six recorded indications in 2002 (and one indication in 2004) evaluated by the PDI-trained examiners in accordance with procedures developed during the PDI are attributed to the root and counterbore geometry of the weld rather than cracks. Therefore, the staff finds that the applicant has appropriately stated that the UT examinations performed during 2002 and 2004 revealed no cracks in the systems as identified in the operating experience in LRA Section B.1.5.

The staff also reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any effects of aging for systems and components within the scope of this program that are not bounded by industry operating experience. The JAFNPP operating experience included detection of cracking due to IGSCC in stainless steel and CASS components. This effect of aging is consistent with industry operating experience and this AMP includes aging management activities, such as UT and leakage, appropriate to detect cracking. Corrective actions were taken in accordance with the Plant Corrective Action Program prior to a loss of intended function of these components.

Based on its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's BWR Stress Corrosion Cracking Program will adequately manage the effects of aging identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.5, the applicant provided the UFSAR supplement for the BWR Stress Corrosion Cracking Program. The staff determines that the information in the

UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's BWR Stress Corrosion Cracking Program, the staff determines that those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.6 BWR Vessel ID Attachment Welds Program

Summary of Technical Information in the Application. LRA Section B.1.6 describes the existing BWR Vessel ID Attachment Welds Program as consistent, with an exception, with GALL AMP XI.M4, "BWR Vessel ID Attachment Welds."

The program includes: (a) inspection and flaw evaluation in accordance with the guidelines of the staff-approved BWRVIP-48-A report and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 (EPRI Report 1008192) to ensure the long-term integrity and safe operation of reactor vessel inside diameter (ID) attachment welds and support pads.

Staff Evaluation. During its audit and review, the staff reviewed the exception to determine whether the AMP, with the exception, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical staff and reviewed the BWR Vessel ID Attachment Welds Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M4.

During the audit and review, the staff asked the applicant to clarify whether the BWR Vessel ID Attachment Welds Program implements the evaluation guidelines of BWRVIP-14, "Evaluation of Crack Growth in BWR Stainless Steel RPV Internals," BWRVIP-59, "Evaluation of Crack Growth in BWR Nickel Base Austenitic Alloys in RPV Internals," and BWRVIP-60, "Evaluation of Crack Growth in BWR Low Alloy Steel RPV Material," as recommended in GALL AMP XI.M4. In its response, the applicant stated that crack growth indications found during reactor vessel internals inspection are documented, evaluated and reported in accordance with these BWRVIP guidelines and the applicable code for the indication. The staff determined that this is acceptable because it is consistent with GALL recommendations.

The staff finds the applicants BWR Vessel ID Attachment Welds Program acceptable because it conforms to the recommended GALL AMP XI.M4, "BWR Vessel ID Attachment Welds" Program with the exception described below.

Exception. The LRA states an exception to the GALL Report program element “parameters monitored/inspected.” Specifically, the exception states:

> Table IWB-2500-1 from the 1989 edition of the ASME Section XI is used while NUREG-1801 specifies the 2001 edition with 2002 and 2003 addenda.

The associated note to this exception states:

> 1. Since ASME Section XI editions through the 2003 Addenda have been accepted by reference in § 50.55a(b)(2) without modification or limitation on use of Table IWB-2500-1 from the 1989 edition for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licencing basis during the period of extended operation. The JAF plant has also submitted a relief request to use BWRVIP inspections, for the most part, in lieu of ASME XI.

As indicated in LRA Amendment No. 5 dated February 1, 2007, the 4th 10-Year ISI Interval for JAFNPP will be the 10-Year ISI interval in effect if the LRA is approved by the staff. The applicant's amendment of the LRA is in compliance with the requirements of 10 CFR 50.55a because the applicant was required by paragraph (b) of the rule to update in Section XI edition of reference to 2001 Edition of Section XI (inclusive of the 2003 Addenda), one year prior to entering the 4th 10-Year ISI Interval for JAFNPP. Based on this assessment, the staff concludes that the changes to the LRA are acceptable because they are in compliance with the requirements of 10 CFR 50.55a and in conformance (i.e., consistent) with the “scope of program” element in GALL AMP XI.M4, “BWR Vessel ID Attachment Welds.”

The staff finds this exception acceptable because the applicable code for the fourth ten-year ISI interval is the 2001 edition of ASME Code Section XI, inclusive of the 2003 Addenda.

Operating Experience. LRA Section B.1.6 states that the following visual examinations of vessel ID attachment welds have been conducted: core spray brackets examined during RO13 (1998) and jet pump riser brace attachments examined 50 percent during RO11 (1994) and 50 percent during RO13. These examinations recorded no indications. Visual and enhanced visual examinations of vessel ID attachment welds during RO15 (2002) and RO16 (2004) recorded no indications. Absence of recordable indications on the vessel attachment welds proves that the program is effective for managing cracking of the welds. As stated in GALL Report, Section XI.M4, “Implementation of the program provides reasonable assurance that crack initiation and growth will be adequately managed and the intended functions of the vessel ID attachments will be maintained consistently with the CLB for the period of extended operation.” The program is consistent with the GALL Report program and recent inspection results recorded no indications, thus, the program is effective in managing the effect of cracking on the intended function of the vessel ID attachments. Self-assessments in 2004 and 2005 revealed no issues or findings with impact on program effectiveness.

The staff interviewed the applicant’s technical staff and also reviewed the operating experience reports and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry operating experience.

In addition, the staff reviewed condition reports for the BWR Vessel ID Attachment Welds Program and did not find any evidence of JAFNPP component degradation or failure outside the envelope of industry experience.

The staff noted that in 2005, a self assessment identified that the applicant's BWRVIP Program was not in compliance with all BWRVIP recommendations. One of the recommendations was to make the BWRVIP Program consistent with BWRVIP recommendations.

During the audit and review, the staff asked the applicant if all the recommendations identified in the corrective action were incorporated in the BWRVIP Program. The applicant confirmed that all recommendations resulting from the BWRVIP self assessment were completed at the end of JAFNPP RO17. The staff confirmed that program deficiencies were identified and resolved through the Corrective Action Program.

Based on its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's BWR Vessel ID Attachment Welds Program will adequately manage the effects of aging identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.6, the applicant provided the UFSAR supplement for the BWR Vessel ID Attachment Welds Program. The staff determines that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

<u>Conclusion</u>. On the basis of its audit and review of the applicant's BWR Vessel ID Attachment Welds Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.7 BWR Vessel Internals Program

<u>Summary of Technical Information in the Application</u>. LRA Section B.1.7 describes the existing BWR Vessel Internals Program as consistent, with exceptions, with GALL AMP XI.M9, "BWR Vessel Internals."

The program includes (a) inspection, flaw evaluation, and repair in conformance with the applicable, staff-approved BWRVIP documents and (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-130 to ensure the long-term integrity of vessel internal components.

Staff Evaluation. During its audit and review, the staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical staff and reviewed the BWR Vessel Internals Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M9. The GALL AMP XI.M9 recommends that applicants implement the augmented inspection and flaw evaluation guidelines of the Boiling Water Reactor Vessel and Internals Program for their reactor vessel and reactor vessel internal components.

Topical Report BWRVIP-94, “BWR Vessel and Internals Project Program Implementation Guide,”establishes the BWRVIP’s recommended guidelines for implementing the augmented inspection, mitigation, and/or flaw evaluation activities provided in the other BWRVIP guideline documents.

During the audit and review, the staff asked the applicant to identify the BWRVIP guidelines that are within the scope of BWR Vessel Internals Program and to clarify whether the implementation guidelines of BWRVIP-94 are within the scope of this AMP.

In its response, the applicant clarified that the BWR Vessel Internals Program is based on GALL AMP XI.M9 and that the scope of the program includes the BWRVIP inspection and flaw evaluation guidelines specified in GALL AMP XI.M9. The applicant also stated that BWRVIP-94 provides the BWRVIP’s guidelines for implementing the BWRVIP reports applicable to JAFNPP and the Entergy Nuclear North (ENN) Procedure ENN-DC-135 requires that the implementation guidelines in BWRVIP-94 be implemented as part of the program. The audit team reviewed Procedure ENN-DC-135 and confirmed that the implementation guidelines in BWRVIP-94 are invoked by the implementation procedure. Based on this assessment, the audit team concludes that the implementation guidelines of BWRVIP-94 are within the scope of the applicant’s BWR Vessel Internals program.

The staff finds the applicant’s BWR Vessel Internals Program acceptable because it is consistent with the recommended GALL AMP XI.M9, “BWR Vessel Internals,” with the exceptions as described:

The applicant identified that the BWR Vessel Internals Program includes five exceptions to the staff position taken in GALL AMP XI.M9. The staff summarizes and evaluates these exceptions in the five paragraphs that follow.

Exception 1. The LRA states an exception to the GALL Report program elements "scope of program," and "detection of aging effects." Specifically, the exception states:

> Core Plate: JAFNPP provides an alternate inspection for the core plate rim hold-down bolts that is technically justified according to BWRVIP-94.

The core plate design at JAFNPP does not rely on core plate wedges or plugs to maintain the structural integrity of the plates during normal operations of the plant (including anticipated operation transients and startup and cooldown operations), pressure test conditions, or

postulated design basis accident conditions. Instead, the integrity of the plates during these conditions is maintained by the rim hold-down bolts.

The BWRVIP's augmented inspection and flaw evaluation criteria for BWR core support plates are provided in Topical Report BWRVIP-25, which was approved by the staff in an safety evaluation (SE) dated December 7, 2000. The staff informed the applicant that Topical Report BWRVIP-94 provides the BWRVIP's implementation guidelines and does not provide a BWRVIP-recommended inspection and flaw evaluation strategy for particular BWR vessel internal components.

During the audit and review, the staff asked the applicant to provide the basis for deviating from augmented inspection and flaw evaluation criteria provided in Topical Report No. BWRVIP-25. Also, the applicant was asked to clarify why it is acceptable to use BWRVIP-94 as the basis for taking this exception when Topical Report BWRVIP-94 is the only implementation guideline document.

The applicant stated that the BWRVIP's recommended methods for performing augmented examinations of the rim hold-down bolts are not feasible for the design and configuration of the rim hold-down bolts at JAFNPP. Because of this issue, the applicant developed technical justifications to deviate from the inspection guidelines of BWRVIP-25 for the augmented examinations of the core plate rim hold-down bolts. The applicant also stated that these justifications were submitted to the staff in accordance with BWRVIP-94 guidelines.

BWRVIP-25 recommends implementation of specific augmented volumetric or visual inspections options for BWR core plates that are secured solely with rim hold-down bolts (*i.e.*, core plates that are not designed with wedges or plugs for structural integrity), or alternatively, that the designs of the core plates be modified to include wedges as the basis for maintaining the structural integrity of core plate against lateral movement. The staff determined that the current basis for inspecting the core plate rim hold-down bolts at JAFNPP relies solely on inspections performed in accordance with ASME Code Section XI, Table IWB-2500-1, B-N-1 requirements. These requirements call for the applicant to implement a VT-3 visual examination of the accessible surfaces of the core plate. The staff concluded that the current basis for examining the core plate would not be sufficient to manage either stress relaxation or cracking of the core plate rim hold-down bolts during the period of extended operation.

In its letter dated April 6, 2007, the applicant committed (Commitment No. 23 (JAFP-07-0019 dated February 1, 2007)) to take the following actions to ensure the structural integrity of the JAFNPP core plate against lateral movement during the period of extended operation.

1. Install core plate wedges prior to the PEO, or,

2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of the core plate rim hold down bolting in accordance with BWRVIP-25, and submit the inspection plan, along with the acceptance criteria and justification for the inspection plan, to the NRC two years prior to the PEO for NRC review and approval.

If Option 2 is selected, the analysis to determine acceptance criteria will address

the information requested in RAIs 3.1.2-2A and 4.7.3.2-1.

Under the current design, the core plate rim hold-down bolts serve as the structural components that maintain the integrity of the core plate against lateral movement. If option 1 of Commitment No. 23 is selected, the installation of core plate wedges will replace the core plate rim hold-down bolts as the basis for maintaining the structural integrity of the core plate against lateral movement during the period of extended operation. This is in accordance with the options provided in BWRVIP-25 and the staff finds this acceptable. If option 2 is selected, the applicant will: (1) perform a plant-specific analysis in accordance with bolt loading analysis criteria in BWRVIP-25, to establish the number of core plate rim hold-down bolts necessary to maintain the structural integrity of the plant's core plate against lateral movement, and (2) submit an inspection plan for the core plate rim hold-down bolts along with the technical basis for the inspection plan for staff review and approval. This is acceptable because the staff has approved the BWRVIP's criteria for performing plant-specific loading analyses of BWR core plate rim hold-down bolts in the staff's SER dated December 7, 2000, and the inspection plan for the core plate rim hold-down bolts will be submitted to the staff for review and approval at least two years prior to entering the period of extended operation.

The staff determined that this exception is acceptable because the alternative basis in LRA Commitment No. 23 is consistent with the staff's conclusions reached in the staff's BWRVIP-25 SER dated December 7, 2000.

Exception 2. The LRA states an exception to the GALL Report program elements "scope of program," and "detection of aging effects." Specifically, the exception states, "Shroud Support: Focused inspection of bottom surface of the shroud support H9 weld."

The applicant's footnote on this exception identified that the focused examination of the H9 weld will be performed in accordance with applicable BWRVIP guidelines.

The BWRVIP's augmented inspection and flaw evaluation criteria for BWR core shroud supports are provided in Topical Report BWRVIP-38, approved by the staff in a SE dated March 1, 2001.

During the audit and review, the staff asked the applicant to confirm if Entergy is referring to the inspection criteria for shroud support structures in Topical Report BWRVIP-38.

In its response, the applicant stated that it would implement the inspections of the JAFNPP core shroud support in accordance with the recommended guideline of Topical Report BWRVIP-38. As indicated in SER Table B.1.7-1, the staff approved the augmented methods for inspecting core shroud supports and attachments in an SE on Topical BWRVIP-38 dated March 1, 2001. The applicant's methods for performing the augmented examinations of the JAFNPP core shroud support and its attachments are acceptable because the applicant will use the methods of inspection proposed in Topical Report BWRVIP-38 and approved by the staff in the SE dated March 1, 2001.

On this basis, the staff concludes that the applicant's proposal to perform a focused examination of the shroud support H9 weld in accordance with BWRVIP-38 examination criteria is acceptable.

Exception 3. The LRA states an exception to the GALL Report program elements "scope of program," and "detection of aging effects." Specifically, the exception states:

> Top Guide: Deferred inspection of hold-down Assemblies at 0° and 180° from RO16 to RO17 with technical justification. The top guide rim weld does not exist at JAFNPP and is therefore exempt.

The applicant also identified that JAFNPP top guide design does not include a rim weld and stated that the top guide is exempt from the augmented inspection criteria in BWRVIP-26 for top guide rim hold-down welds.

The BWRVIP's augmented inspection and flaw evaluation criteria for BWR top guides are provided in Topical Report BWRVIP-26 and approved by the staff in an SE dated December 7, 2000. The staff concluded that the JAFNPP top guide design provides an acceptable basis for exempting the top guide from the inspection criteria in BWRVIP-26 for top guide rim welds because the weld does not exist in the design.

During the audit and review, the applicant informed the staff that the deferral of the inspection of the top guide hold-down assemblies at the 0 °and 180 ° azimuthal locations from RO16 to RO17 was based on a management decision. The applicant clarified that Entergy has been performing the BWRVIP-26-A inspections of the top guide hold-down assemblies in spite of the "lift off" analysis in Topical Report BWRVIP-26-A that demonstrates that the JAFNPP top guide will not lift under the vertical loads associated with the limiting seismic event (*i.e.*, under the vertical loads associated with the postulated faulted conditions for the plant). The staff concludes that a deferral of one RO for performing the inspections of the top guide hold-down assemblies is a decision that is limited to the current licensed operating period for JAFNPP and that the deferral of the top guide hold-down assemblies examinations from RO16 to RO17 will not impact the applicant's schedule for inspecting these locations during the period of extended operation. On this basis, the staff concludes that this exception is acceptable.

During the audit and review, the staff asked the applicant whether the augmented inspections of the top guide grid beam locations would conform to the recommendations in GALL AMP XI.M9 for top guide grid beam locations. GALL AMP XI.M9 established the position that for BWR top guides with neutron fluences exceeding a fluence of 5×10^{20} n/cm^2 ($E > 1.0$ MeV), the BWR plants should perform EVT-1 examinations of a total of five percent of the top guide grid beam locations within six years of entering the period of extended operation, and an additional five percent of the top guide cross hatch areas within 12 years of entering the period of extended operation. The staff also asked the applicant to provide a technical justification that clarifies how the program basis in the commitment is considered sufficient to manage irradiation-assisted stress corrosion cracking (IASCC) in the top guide for the period of extended operation years 12 through 20.

In its response, the applicant provided Commitment No. 21 (JAFP-06-0167, dated December 6, 2006) on the LRA to address augmented inspections of the JAFNPP top guide grid beam locations for the period of extended operation. In Commitment No. 21 letter dated April 6, 2007, Entergy committed to performing the following augmented inspections of the JAFNPP top guide grid beam locations:

> Enhance the BWR Vessel Internals Program to inspect fifteen (15) percent of the top guide locations using enhanced visual inspection techniques. EVT-1, within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first six (6) years and at least two-thirds within the first 12 years of the period of extended operations. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.

GALL AMP XI.M9 recommends that BWR applicants perform EVT-1 examinations of five percent of their top guide grid beam locations with six years of entering the period of extended operation and an addition five percent of the grid beam locations within 12 years of entering the period of extended operation. The staff determined that LRA Commitment No. 21 is more conservative than the criteria specified in GALL AMP XI.M9 and is acceptable.

Exception 4. The LRA states an exception to the GALL Report program elements "Scope of Program," and "Detection of Aging Effects." Specifically, the exception states:

> Jet Pump Assembly: Inspections for inaccessible welds, beam (UT), and scheduled inspections of high ranked welds have been deferred, but the deferrals are technically justified.

The associated note to this exception states:

> Welds at TS-1, TS-3 and TS-4 are inaccessible for inspection. There is no inspection technique developed to inspect the thermal sleeve welds. However, the BWRVIP/EPRI NDE Center has new plans to develop an inspection capability. The BWRVIP is also pursuing analyses which may reduce or alleviate inspection of the TS-1 through TS-4 welds. Inspection is recommended when techniques or accessibility becomes available. Also, there are other welds mainly along the diffuser lower section where coverage is low due to interference from core shroud gussets, tie rods, and others. The BWRVIP is also pursuing an analysis to reduce or alleviate inspection of the adapter welds. A technical justification for inspecting inaccessible jet pump welds, and the deferral of beam UT inspection has been prepared per BWRVIP-94 guidelines. Finally, several high priority ranked welds in JP-1,2,3, 4, 19 and 20 previously scheduled for inspection in RO16, were deferred to RO17 (one cycle deferral) with technical justification.

The BWRVIP’s augmented inspection and flaw evaluation criteria for BWR jet pump assembly components are provided in Topical Report BWRVIP-41 and approved by the staff in an SE dated June 5, 2001. The report recommends either specific visual or volumetric examination methods for the various jet pump assembly components that are within the scope of BWRVIP-41. The report also includes the specific details on the inspection frequencies and sample sizes that are recommended for these examinations.

During the audit and review, the staff asked the applicant to provide its basis for deferring the augmented examinations for those JAFNPP jet pump assembly components addressed in Footnote 2 and for concluding that additional augmented inspections of other jet pump

assembly components in BWRVIP-41 will be sufficient to ensure the integrity of the jet pump assemblies during the period of extended operation.

In its response, the applicant stated that New York Power Authority (the previous owner of JAFNPP) replaced the jet pump hold down beams in 1992. The applicant clarified that the decision to defer the baseline examinations of the jet pump assembly from RO16 (Fall 2004) to RO17 (Fall 2006) was based on other higher priorities for inspecting the RPV components. The applicant clarified that it did perform the augmented examinations of all twenty jet pump assembly hold-down beams during RO17 as recommended in BWRVIP-41 and that the examinations did not result in any recordable indications in these components. Based on the replacement of the jet pump hold-down beams in 1992 and lack of indications from the RO17 augmented examination results, the staff concludes that it was acceptable to defer the augmented examinations of the jet pump hold-down beams for a period of one cycle. The staff concludes that a deferral by one RO for performing the inspections of the jet pump assembly components is a decision that is limited to the current licensed operating period for JAFNPP and will not impact the applicant's schedule for inspecting these locations during the period of extended operation.

The applicant also clarified that it performed augmented examinations of the high-priority jet pump welds in the jet pump diffuser and adapter and jet pump lower ring assemblies as recommended in BWRVIP-41. The applicant stated that these examinations resulted in recordable indications in the DF-2 welds in jet pumps Nos. 1 and 3 and in the AD-3b/DF-3 welds in jet pumps Nos. 12 and 17. The applicant stated that these indications were determined to be acceptable for further service in accordance with the staff-approved flaw evaluation methods in BWRVIP-41. The staff finds this acceptable because the applicant has evaluated the flaws in accordance with the methods in BWRVIP-41, approved in the staff's SE dated June 5, 2001. On this basis, this exception is acceptable.

Exception 5. The LRA states an exception to the GALL Report program elements "parameters monitored/inspected." Specifically, the exception states:

> JAFNPP uses ASME Section XI Table IWB-2500-1 from the 1998 edition with 2000 addenda, which is a different code year than that specified in NUREG-1801.

The applicant's note on this exception provides the following clarifications:

> Since ASME Section XI through the 2003 Addenda has been accepted by reference in 10CFR50.55a(b) (2) without modification or limitation on use of Table IWB-2500-1 from the 1998 edition with 2000 addenda for BWR components, use of this version is appropriate to assure that components crediting this program can perform their intended function consistent with the current licensing basis during the period of extended operation. The JAF plant has also submitted a relief request to use BWRVIP inspections, for the most part, in lieu of ASME XI.

The applicant entered the fourth ten-year ISI interval for JAFNPP in January 2007. The applicant was required by 10 CFR 50.55a(g)(4)(i) to update the ASME Code Section XI

(Section XI code of record) to the 2001 Edition of Section XI, inclusive of the 2003 Addenda. The staff requested clarification from the applicant on whether the Section XI code of record for the fourth ten-year ISI interval is the 2001 Edition of Section XI, inclusive of the 2003 Addenda.

The applicant clarified in its response that the 2001 Edition of ASME Code Section XI, inclusive of the 2003 Addenda will be the new Section XI code of record for those JAFNPP AMPs referencing or crediting ASME Code Section XI requirements. The applicant also stated that LRA Section A.2.1.18 will be amended to delete the relevant information for the third ten-year ISI interval and to incorporate the relevant information for the fourth ten-year ISI interval for JAFNPP, including a statement that the 2001 Edition of ASME Code Section XI, inclusive of the 2003 Addenda is the applicable edition of Section XI for the fourth ten-year ISI interval. The staff confirmed that the applicant revised the LRA in a letter dated February 1, 2007 (LRA Amendment No. 5).

The ASME Code Section XI, Examination Category B-N-1, B-N-2 and B-N-3 requirements provide the 10-Year Interval ISI requirements for inspecting the BWR internals at JAFNPP. The 4th 10-Year ISI Interval for JAFNPP will be the 10-Year interval in effect, if the LRA for JAFNPP is approved by the staff. In its exception to the GALL Report, the applicant has appropriately revised the LRA to refer to the Edition of Section XI that will be in effect upon issuance of renewed operating license for the facility (pending its approval). This is in compliance with the requirements of 10 CFR 50.55a and in conformance (i.e., consistent) with the “scope of program” element in GALL AMP XI.M9, “BWR Vessel Internals,” and is acceptable.

Operating Experience. In LRA Section B.1.7, the applicant provides a summary of the operating experience that is applicable to reactor vessel (RV) internals at JAFNPP. The applicant stated that self-assessments of the BWR Vessel Internals Program in 2004 and 2005 reveal no issues, signs of weakness, or findings with regard to the program’s effectiveness.

The applicant indicated that the following age-related operating experience was applicable to RV internal components at JAFNPP:

Steam Dryer - The applicant stated that multiple steam dryer upper support ring cracks were detected during refueling outage (RO) 10 (in 1992). The applicant stated that subsequent visual examination in the same area during RO14 (in 2000) revealed no change in the cracks. The applicant also stated that cracking due to intergranular stress corrosion cracking (IGSCC) was detected in the steam dryer during RO16 (in 2004). The applicant stated that the degraded area will be visually re-examined in R017.

Topical Report BWRVIP-139 provides the BWRVIP’s recommended inspection and flaw evaluation guidelines for BWR steam dryers. BWRVIP-139 is still pending staff approval. During the audit and review, the staff asked the applicant to clarify what type of aging management strategy (i.e., program) was being used to manage cracking in the steam dryer. The staff also informed the applicant that, if the applicant is crediting BWRVIP-139 for aging management of the steam dryer, the applicant must place a commitment on the LRA to use the staff-approved version of BWRVIP-139, once the approved version of the report is issued. Further, this commitment must be referenced in LRA Section A.2.1.7.

The applicant clarified in its response that Entergy will manage age-related degradation of the steam dryer in accordance with Topical Report BWRVIP-139, as approved by the staff and accepted by the BWRVIP Executive Committee. The applicant stated that LRA Sections B.1.7, and A.2.1.7 will be amended to specify that the BWR Internals Program will be enhanced to state that Topical Report BWRVIP-139 will be used as the basis for managing the aging effects applicable to the steam dryer at JAFNPP. The applicant stated that the enhancement will be incorporated into a commitment on the LRA and will require a license amendment.

In its letters dated December 6, 2006, the applicant amended LRA Section B.1.7 and A.2.1.7 to specify that the BWR Internals Program is enhanced to the staff-approved version of BWRVIP-139 for aging management of the steam dryer and that this enhancement is provided in LRA Commitment No. 22 (JAFP-06-0167, dated December 6, 2006). This commitment specifically states that the applicant will enhance the BWRVIP to ensure that the effects of aging of the steam dryer are managed in accordance with the guidelines of BWRVIP-139, as approved by the staff and acceptable by the BWRVIP Executive Committee. Commitment No. 22 must be implemented prior to entering the period of extended operation. Staff finds this is acceptable because the applicant will use the staff-approved version of BWRVIP-139 for aging management of the steam dryer at JAFNPP.

Core Shroud - The applicant stated that during RO14 (in 2000), crack-like indications were detected in four of the vertical seam welds in the core shroud. The applicant reported that the most limiting core shroud weld, Weld No. SV5B, was re-examined in RO15 (in 2002) with no discernible changes in the indications; however, the applicant reported that an additional indication has been detected. The applicant stated that several of the core shroud vertical welds are scheduled for ultrasonic examination in R017.

During the audit and review, the staff asked the applicant to clarify whether or not the JAFNPP core shroud had been repaired with mechanical repair assemblies (i.e., either tie rod or mechanical clamp assemblies) and if so, to identify which core shroud welds the repair assemblies were assuming the loading conditions for and which welds were not covered by the repair assemblies. The staff also asked the applicant, during the audit and review, to discuss what type of examination methods, frequencies and sample sizes were being credited for aging management of the JAFNPP core shroud and its repair assemblies.

The staff also noted that the applicant had reported the occurrence of flaw indications in core shroud vertical welds SV5A and SV5B. Core shroud repair hardware assembly designs assume the tensile loading conditions in core shrouds but do not assume the circumferential loading conditions (hoop stress conditions) for the shrouds. Flaw growth of cracking in vertical core shroud seam welds is predominantly driven by hoop stresses.

During the audit and review, the staff asked the applicant to resolve the following technical questions relative to the cracking that was detected in the shroud vertical welds:

- Identify what type of cracking mechanism was determined to be the root cause of the cracking in the vertical welds;
- Identify what type of inspection methods were used to re-examine the impacted welds for signs of flaw growth, as visual examinations are not valid methods to verify whether flaw growth is occurring;

- Clarify, with a supporting technical justification, why Entergy considers the relevant flaw indications to be acceptable for further service without mandating proper repair of the indications.
- Clarify and discuss what type of non-destructive examination method Entergy will be implementing to reexamine the vertical welds in the core shroud if the indications in the vertical welds have been determined to be acceptable for further service, or clarify what type of repair contingencies Entergy will implement if the indications in the shroud vertical welds are determined to be unacceptable for further service.

The applicant stated in its response that ten (10) core shroud tie rod assemblies were installed on the outside of core shroud in 1994. The applicant clarified that the tie rod assemblies were installed to assume the loading conditions in the core shroud during normal operations (including heatups and cooldowns of the reactor and anticipated operational transients), pressure test conditions, and postulated design basis events. The applicant clarified that the tie rod assemblies include associated radial seismic restraints that are designed to limit lateral movement of the shroud during these type of conditions. The applicant also stated that it manages the aging effects associated with the core shroud and the core shroud tie rod assemblies in accordance with the inspection and flaw evaluation criteria provided in Topical Report BWRVIP-76.

The applicant also clarified that the flaw indications of core shroud vertical welds SV5A and SV5B were attributed to intergranular stress corrosion cracking and that the crack indications were detected and sized using UT examination techniques. The applicant clarified that these flaw indications were evaluated in accordance with the augmented flaw evaluation acceptance criteria in BWRVIP-76 and flaw indications were determined to be acceptable for further service until refueling outage (RO) 18. The applicant stated that it will perform a calculation in accordance with the BWRVIP-76 flaw evaluation criteria that will be used to establish the inspection frequency and sample size for the re-inspections of the core shroud vertical welds.

Topical Report BWRVIP-76 provides the BWRVIP's recommended inspection and flaw evaluation guidelines for BWR core shrouds. The staff approved BWRVIP-76 for implementation and the augmented inspection basis for BWR core shrouds and core shroud repair assemblies in staff SEs dated July 27, 2006 (Proprietary SE) and July 28, 2006 (Non-Proprietary SE). As stated earlier in this evaluation, the staff has confirmed that the applicant is both implementing the BWRVIP implementation guidelines of BWRVIP-94 and the staff-approved inspection and flaw evaluation criteria of BWRVIP-76 for the inspection of the JAFNPP core shroud (including the shroud vertical welds) and the core shroud tie rod repair assemblies. Based on the applicant's response to the staff's question, the staff concludes that it is acceptable to use BWRVIP-76 as the basis for managing cracking in the JAFNPP core shroud and core shroud tie rod assemblies. The staff questions on aging management of the core shroud and core shroud tie rod repair assemblies are resolved.

Core Spray Piping Cracking - The applicant stated that it had detected a core spray piping indication reported in R014 (2000) and was re-examined (after brushing) in R015 (2002). Re-examination revealed no change in the length of the indication and the applicant concluded that the indication is a scratch rather than a crack.

The staff also reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s BWRVIP will adequately manage the aging effects that are identified in the LRA for which this AMP is credited.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.7, the applicant provided the UFSAR supplement for the BWR Vessel Internals Program. The staff reviewed this section and determined that UFSAR Supplement Section A.2.1.7 provided a sufficient technical description of the BWRVIP but did not reflect the need for an additional commitment on the LRA to use the staff-approved version of BWRVIP-139 for the aging management of the JAFNPP steam dryer. The staff determined that LRA Section A.2.1.7 should be amended to reflect this commitment.

In letters dated December 6, 2006, the applicant amended the LRA Section B.1.7 and A.2.1.7 to specify that the BWR Internals Program is enhanced to use the staff-approved version of BWRVIP-139 for aging management of the steam dryer and that this enhancement is provided in LRA Commitment No. 22.

In its response dated February 1, 2007, the applicant stated that LRA Section B.1.7 and A.2.1.7 " in addition to the scope described in GALL Report, JAFNPP Scope also includes the steam dryer: BWRVIP-139 and GE SIL 644, Rev. 1, provide guidelines for inspection and evaluation. JAFNPP follows BWRVIP-139 and GE SIL 644, Rev. 1 guidelines."

Based on the LRA amendment, the staff concludes the information in the UFSAR Section A.2.1.7 provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant’s BWR Vessel Internals Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and the associated justifications, and determined that the AMP is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.8 Diesel Fuel Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.9 describes the existing Diesel Fuel Monitoring Program as consistent, with exception and enhancements, with GALL AMP XI.M30, "Fuel Oil Chemistry."

The program entails sampling to maintain adequate diesel fuel quality to prevent corrosion of fuel systems. Exposure to fuel oil contaminants like water and microbiological organisms is minimized by periodic sampling and analysis, draining and cleaning of tanks, and verifying the quality of new oil before its introduction into the storage tanks.

The enhancements to this program will be implemented prior to the period of extended operation. This is Commitment No. 3 (JAFP-06-0109, dated July 31, 2006) in the applicant's letter dated December 6, 2006.

Staff Evaluation. During its audit and review, 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 the Diesel Fuel Monitoring Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine their consistency with GALL AMP XI.M30.

In addition, to assess the applicant's compliance with the ASTM standards, the staff reviewed the following:

- D 4057, "Standard Practice for Manual Sampling of Petroleum and Petroleum Products," dated 1995
- D 975, "Standard Specification for Fuel Oils," dated 2006
- D1796, "Standard Test method for Water and Sediment in Fuel Oils by the Centrifuge Method," dated 2004
- D 2276, "Standard Test method for Particulate Contaminant in Aviation Fuel by Line Sampling," dated 2000
- D 6217, "Standard Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration," dated 2003

The staff verified that the applicant's Diesel Fuel Monitoring Program includes sampling and analysis activities on diesel fuel that are in accordance with ASTM standard D 4057 for sampling, D 975 for analysis, D 1796 for water and sediment monitoring, and D 6217 for particulates monitoring. The applicant also measures flashpoint for the diesel fuel. These activities are consistent with the recommendations in GALL Report.

During the audit and review, the staff asked the applicant to provide the sampling frequency for the diesel fuel storage tanks. In its response, the applicant stated that the EDG fuel oil storage tanks are sampled every 31 days, and the diesel fire pump fuel oil tanks are sampled every 92 days. The staff reviewed plant procedure SP-01.07, "Diesel Fuel Oil Sampling and Analysis,"

Revision 7, and confirmed the sampling frequencies. The staff also verified that the sampling frequencies are in accordance with the plant's Technical Specifications. The staff determined that the sampling frequencies are consistent with current industry standards, and are consistent with the plant technical specifications. The sampling frequencies will provide for timely detection of fuel oil contamination, and will allow corrective actions to be taken, as needed, prior to the loss of intended function. On this basis, the staff finds these sampling frequencies acceptable.

The staff finds the applicant's Diesel Fuel Monitoring Program acceptable because it is consistent with the recommended GALL AMP XI.M30, "Fuel Oil Chemistry," with the exception and enhancements as described:

Exception. The LRA states an exception to the GALL Report program elements "scope of program," "parameters monitored or inspected," and "acceptance criteria." Specifically, the exception states:

> The guidelines of ASTM Standard D 2276 are not used for determination of particulates.

The staff noted that the discussion of this exception of the LRA includes a footnote, which states the following:

> JAFNPP technical specifications specify use of ASTM D 6217, which is a test specifically for diesel fuel, rather than ASTM D 2276, which is for aviation fuel. Therefore, the guidelines of D 6217 are appropriate for determination of particulates.

The staff noted that GALL AMP XI.M30 recommends ASTM D 2276 or D 6217 for the measurement of particulates in diesel fuel. The staff reviewed both standards and determined that ASTM standard D 2276 is applicable for aviation fuels, while D 6217 is applicable for middle distillate fuels, such as that used at JAFNPP. The staff verified that the use of ASTM standard D 6217 is consistent with the requirements in the plant technical specifications. Therefore, the staff concludes that this exception is acceptable.

Enhancement 1. The LRA states an enhancement to the GALL Report program elements "preventive actions" and "detection of aging effects." Specifically, the enhancement states:

> The diesel fuel monitoring program will be enhanced to include periodic draining, cleaning, visual inspections, and ultrasonic measurement of the bottom surfaces of the fire pump diesel fuel oil tanks, EDG day tanks, and EDG fuel oil storage tanks to ensure that significant degradation is not occurring.

During the audit and review, the staff asked the applicant for additional details on the frequency for draining, cleaning, and inspecting the diesel fuel storage tanks. In its response, the applicant stated that the emergency diesel underground fuel oil storage tanks are cleaned and inspected on an eight-year frequency and were UT inspected in 1988. These inspections have not revealed any degradation in the surface of the tank. Inspections are performed on the tank bottoms since this is where water and sediment accumulate, making the bottoms the most susceptible area for corrosion. The applicant proposed to continue to inspect these tanks on

this eight-year frequency based on past inspection results. If any significant corrosion is detected, inspections on adjacent areas of the tank bottom will be performed using the appropriate grid size based on the size of the tank.

The applicant also stated that the fire pump diesel fuel oil tanks and the EDG day tanks will be inspected on an eight-year frequency similar to the EDG underground storage tanks. This frequency is based on past inspection results of the EDG underground fuel oil storage tanks, which have not documented significant degradation and are exposed to the same internal fuel oil environment. If initial inspections find unexpected conditions, the frequency will be adjusted via the corrective action process.

The staff determined that the applicant's enhancement will add routine draining, cleaning, visual inspections, and ultrasonic measurement of the bottom surfaces of the diesel fuel tanks, which are consistent with the recommendations in the GALL Report. The frequency for draining, cleaning and inspecting the tanks will be based on past experience, which has been demonstrated to provide acceptable performance for the diesel fuel storage tanks. Ultrasonic measurement of the tank bottoms will provide objective evidence that degradation of the tanks is not occurring. The staff finds that the selection of the tank bottoms for ultrasonic inspection is appropriate since any moisture in the oil will tend to settle to the bottom of the tanks, making this the most susceptible location for degradation. The staff finds the enhancement acceptable because with the enhancement, the Diesel Fuel Monitoring Program will be consistent with GALL AMP XI.M30 and will add assurance of adequate management of aging effects (Commitment No. 3).

Enhancement 2. The LRA states an enhancement to meet the GALL Report program element "Acceptance Criteria." Specifically, the enhancement states:

> The diesel fuel monitoring program will be enhanced to specify acceptance criterion for UT measurements of diesel generator fuel storage tanks within the scope of this program.

The staff determined that the applicant's enhancement will specify acceptance criteria for UT measurements of diesel generator fuel storage tanks within the scope of this program, which is consistent with the recommendations in the GALL Report. The acceptance criteria will provide a measure to determine whether corrective actions are required based upon inspection results. The staff finds the enhancement acceptable because with the enhancement, the Diesel Fuel Monitoring Program will be consistent with GALL AMP XI.M30 and will add assurance of adequate management of aging effects (Commitment No. 3).

Operating Experience. LRA Section B.1.9 states that in 2000 sample results for EDG fuel oil storage tanks (93TK-6B and D) exceeded the industry acceptable limit for particulate contamination. Resample results of TK-6B were acceptable. Storage tank TK-6D was drained and refilled with fresh fuel oil. In May 2000 approximately 20 gallons of fuel oil were added to fire pump diesel fuel oil tank 76TK-10 from a fuel oil tank that had not been sampled to ensure that it met fuel oil quality requirements. In 2002, trending of bottom sample results for EDG fuel oil storage tank 93TK-6C showed a particulate contamination increase from 3 mg/liter to 6-8 mg/liter. Two thousand gallons of fuel oil were removed from the bottom of the tank and the tank was refilled with fresh fuel oil. In 2004, the testing frequency for new fuel oil was not per

requirements. Technical specifications require that within 31 days following addition of the new fuel oil to storage tanks properties of the new fuel oil be verified as within the limits for the American Society for Testing and Materials 2D fuel oil. Results from samples of new fuel oil sent to offsite testing facilities were not received within the 31-day time frame. Procedures were revised and new testing vendors were employed to prevent recurrences of such events. Other than these instances, fuel oil sampling results from 2000 through 2004 revealed that fuel oil quality has been maintained in compliance with acceptance criteria. Visual inspections of EDG fuel oil tank internals in 1995 (93TK-6B), 2001 (93TK-6A and D), and 2004 (93TK-6C) revealed no degradation. Ultrasonic inspections of the EDG fuel oil tanks in 1988 also revealed no degradation. Continuous confirmation of diesel fuel quality, timely corrective actions, and absence of degradation in the fuel oil storage tanks prove that the program is effective in managing loss of material of fuel system components.

The staff reviewed the Diesel Fuel Monitoring Program operating experience in the LRA and determined that it has detected increases in the contamination level of the diesel fuel in a timely manner such that corrective actions could be taken prior to the loss of intended function of the components. In cases where contaminant levels were exceeded, corrective actions included resampling or replacement of the fuel. Resampling is appropriate to verify that the initial results were not anomalies caused by inappropriate sampling procedures. After results are confirmed, replacement of the contaminated fuel is an appropriate corrective action to remove contaminants from the fuel stream. Instances in which the fuel sampling frequency was not met were also identified. In these instances, the applicant revised the plant procedures and used different vendors to provide more timely analysis of the fuel. These corrective actions are appropriate to ensure future sampling frequencies are met.

The staff also reviewed the operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience. The staff noted that none of the condition reports identified as aging-related involved components exposed to diesel fuel oil. The staff finds that this an acceptable indication that components in the diesel fuel systems at JAFNPP are not experiencing any aging effects that are not bounded by industry operating experience.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s Diesel Fuel Monitoring 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.9, the applicant provided the UFSAR supplement for the Diesel Fuel Monitoring Program. The staff reviewed the applicant’s license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that enhancements to this program is identified as Commitment No. 3, to be implemented before the period of extended operation. The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Diesel Fuel Monitoring Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.9 External Surfaces Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.11 describes the existing External Surfaces Monitoring Program as consistent, with enhancement, with GALL AMP XI.M36, "External Surfaces Monitoring."

This program entails inspections of external surfaces of components subject to an AMR. The program is also credited with managing loss of material from internal surfaces where internal and external material and environment combinations are the same and the external surface condition represents the internal.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the External Surfaces Monitoring Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M36.

The staff determined that this program uses visual inspection methods to manage loss of material for external surfaces of components. The program also manages loss of material from internal surfaces and for situations in which internal and external material and environment combinations are the same (*e.g.,* external surface condition is representative of internal surface condition). Surfaces that are inaccessible during plant operations are inspected during refueling outages. Surfaces are inspected at regular frequencies to provide assurance that the effect of aging will be managed such that applicable components will perform their intended function during the period of extended operation.

The staff finds the applicant's External Surfaces Monitoring Program acceptable because it is consistent with the recommended GALL AMP XI.M36, "External Surfaces Monitoring," with an enhancement as described:

Enhancement. The LRA Section B.1.11 states an enhancement to the GALL Report program element "scope of program." Specifically, the enhancement states:

> External surfaces monitoring program guidance documents will be enhanced to clarify license renewal commitment. The commitment for license renewal is for periodic inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject systems will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(2).

The staff determined that the applicant currently performs inspections of the systems within the scope of this program; however, the guidance documents used to perform these inspections may not include a requirement to inspect surrounding areas, which is required for license renewal. This enhancement will add a requirement to the existing plant guidance documents to include areas surrounding the subject systems to identify hazards to those systems. The staff determined that inspection of surrounding areas to identify potential hazards that could damage the system components is appropriate, since these hazards could result in a loss of system function. Adding a requirement to inspect surrounding areas will provide assurance that no hazards exist and will make the AMP consistent with the recommendations in the GALL Report. On this basis, the staff finds this enhancement acceptable (Commitment No. 4 (JAFP-06-0109, dated July 31, 2006)).

Operating Experience. LRA Section B.1.11 states that external Surface Monitoring walkdowns between 2000 and 2004 detected evidence of aging effects, including corrosion and leakage. Corrective actions were implemented in accordance with the site corrective action program. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing aging effects for passive components.

The staff interviewed the applicant's staff and also reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience. The JAFNPP operating experience included detection of corrosion on component external surfaces, as well as external leakage from valves. These aging effects are consistent with industry operating experience, and this AMP includes aging management activities, such as visual inspections, that are appropriate to detect these aging effects. Corrective actions were taken in accordance with the plant corrective action program prior to a loss of intended function of the component.

To confirm the effectiveness of this program, the staff reviewed two plant condition reports (CRs). In one CR, the applicant documents the discovery of a small packing leak in the HPCI steam supply isolation valve during a system walkdown inspection. The valve leakage condition was documented, a work order was performed to adjust the packing, and the leak was repaired. In the second CR, the applicant documents the detection of corrosion under the metal roof decking of the auxiliary boiler building during a structural monitoring walkdown. The condition of the roof was documented and evaluated. The applicant determined that there were no structural concerns associated with the condition at that time and the monitoring frequency was increased to a 2-year cycle (from 5 years). These examples are verification that system problems are being detected by the program and corrective actions are being implemented.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's External Surfaces Monitoring 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.11, the applicant provided the UFSAR supplement for the External Surfaces Monitoring Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007 and confirmed that the program enhancement is identified as Commitment No. 4, to be implemented before the period of extended operation.

The staff determines that the information in the UFSAR supplement is an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's External Surfaces Monitoring Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report, are consistent. Also, the staff reviewed the enhancement and confirmed that the implementation of the enhancement prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.10 Fatigue Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.12 describes the existing Fatigue Monitoring Program (FMP). The applicant identified this program as an existing AMP that is consistent with program attributes in GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary," with exceptions.

That applicant stated that in order not to exceed usage design limits on fatigue, the FMP tracks the number of critical thermal and pressure transients for selected reactor coolant system components. The program validates analyses that explicitly assume a specified number of fatigue transients by assuring that the actual effective number of transients is not exceeded.

Staff Evaluation. During its audit and review, the staff reviewed the exceptions to determine whether the AMP, with the exceptions, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical staff and reviewed the Fatigue Monitoring Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP X.M1.

The staff finds the applicant's Fatigue Monitoring acceptable because it is consistent with the recommended GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary," with exceptions as described:

Exception 1. The LRA states an exception to the GALL Report program elements "preventive actions" and "acceptance criteria."

Specifically, the exception stated that "only involves tracking the number transient cycles and does not include assessment of the impact of the reactor water environment of on critical components."

The applicant clarified in a footnote to this exception that it evaluates the impact of the reactor water environment on the CUF fatigue calculations for critical components in the reactor pressure vessel and other parts of the reactor coolant pressure boundary in LRA Section 4.3.3. The staff reviewed the LRA to determine whether the applicant had an environmental fatigue evaluation for critical component locations in the RCPB. The staff confirmed that the applicant identified and assessed its environmental fatigue analysis for these components. Since the applicant has included the environmental fatigue analysis for critical components, the staff concludes that the applicant does not need to include this analysis as part of the FMP. Based on this assessment, the staff concludes that this exception is acceptable. The staff evaluates the environmental fatigue analysis for the RCPB in SER Section 4.3.3.

Exception 2. The LRA states an exception to the GALL Report program element "detection of aging effects." Specifically, the exception stated that the FMP does not provide for periodic updates of the fatigue usage calculations.

The LRA states the following footnote to this exception:

> Updates of fatigue usage calculations are not necessary unless the number of accumulated fatigue cycles approaches the number of assumed design cycles. The JAFNPP program provides for periodic assessment of the number of accumulated cycles. If a design cycle assumption is approached, corrective action is taken which may include update of the fatigue usage calculation.

Based on the audit and review, the staff determined that plant Procedure No. RAP-7.4.10,"Component Cyclic or Transient Limit Program,"Revision 2, calls for the applicant to implement corrective actions before the number of recorded accumulated cycles exceeds the limit on the number of assumed cycles for the applicable transient in the design basis. As indicated in the TLAA on metal fatigue (refer to LRA Section 4.3), the options for corrective actions include either a reanalysis of the CUF values for the components impacted by the transients, inspections of the components for cracking, or repair or replacement of the impacted components.

The staff considers the applicant's plant procedure provides adequate guidance to ensure that corrective actions will be implemented prior to exceeding the CUF. Based on this assessment the staff concludes that this exception is acceptable.

Operating Experience. LRA Section B.1.12 states that for recent reactor shutdowns and startups cycle limitations did not trend toward exceeding the allowable number of cycles but demonstrated that the program continues to monitor plant transients and track their accumulation.

The staff interviewed the applicant's technical staff and also reviewed the operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience.

A review of sample condition reports indicated that potential nonconforming conditions are identified, evaluated and resolved. The staff found 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.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Fatigue Monitoring 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.12, the applicant provided the UFSAR supplement for the Fatigue Monitoring Program. The staff determines that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Fatigue Monitoring Program, the staff determines that those program elements, for which the applicant claimed consistency with the GALL Report, are consistent with the GALL Report. In addition, the staff reviewed the exceptions and the associated justifications and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.11 Fire Protection Program

Summary of Technical Information in the Application. LRA Section B.1.13.1 describes the existing Fire Protection Program as consistent, with enhancements, with GALL AMP XI.M26, "Fire Protection."

The Fire Protection Program includes a fire barrier inspection and a diesel-driven fire pump inspection. The fire barrier inspection requires periodic visual inspection of fire barrier

penetration seals, fire dampers and frames, fire barrier walls, ceilings, and floors, and periodic visual inspection and functional tests of fire-rated doors to maintain their operability. The diesel-driven fire pump and its driver are tested periodically to ensure that diesel engine subsystems, including the fuel supply line, can perform their intended functions.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the Fire Protection Program bases documents including the Technical Requirement Manual (TRM). Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M26.

The staff identified during its review that the applicant did not include the Halon/CO_2 fire suppression system within the scope of the Fire Protection Program as recommended by GALL Report XI M26. The GALL Report recommends that an AMP be established to evaluate the periodic visual inspection and functional testing at least once every six months to examine the signs of degradation of the Halon/CO_2 fire suppression system. Material conditions that may affect the performance of the system, such as corrosion, mechanical damage, or damage to dampers, are observed during these tests.

During the audit and review, the staff asked the applicant why the CO_2 system is not included in the Program Description of the AMP.

In its response, the applicant stated that it will include CO_2 within the scope of the program. In its response dated February 1, 2007, the applicant amended the LRA (Amendment No. 5) "program description" Section B.1.13.1 to state "The program also includes Plant CO_2 fire suppression system valve position checks and operational tests, CO_2 storage tank level and pressure checks, system functional checks, and external surface inspections," and added an exception to the GALL element "detection of aging effects."

As noted in LRA Table 3.3.2-6, the aging effects of the fire protection-CO_2 fire suppression system are managed by the Bolting Integrity Program (Section B.1.30) and by the Fire Protection Program (B.1.13.1). However, no mention of the Halon fire suppression system was mentioned in LRA Section B.1.13.1. A review of UFSAR 9.8.3.11 indicated that the halon fuel suppression system is used for fire protection in the Emergency and Plant Information Computer (EPIC) Room, where it is not desirable to use a water spray or a sprinkler system. The staff asked the applicant, during the audit and review, if the system is credited for a safe shutdown in any fire scenarios pursuant to10 CFR 50.48 and if so, provide justification of why an AMP is not required or provide an AMP that contains the required ten elements. In its response, the applicant stated that the EPIC system is not credited for a safe shutdown in any fire scenarios to demonstrate compliance with 10 CFR 50.48. The halon fire suppression system is required for insurance purposes but is not required to protect safety-related systems. Therefore, the system has no intended functions pursuant to 10 CFR 54.4(a)(1) or (a)(3). Also, since the system does not contain liquids that could leak and cause physical interaction with safety-related components, it does not have any intended functions pursuant to 10 CFR 54.4(a)(2). Based on the above and since the system does not have any

license-renewal-related intended functions, the staff determined that the applicant's response is acceptable.

The staff reviewed those portions of the Fire Protection Program for which the applicant claims consistency with GALL AMP XI.M26 and found that they are consistent with the GALL AMP. Furthermore, the staff concludes that the applicant's Fire Protection Program reasonably assures management of aging effects so components crediting this program can perform intended functions consistent with the CLB during the period of extended operation. The staff finds the applicant's Fire Protection Program acceptable because it conforms to the recommended GALL AMP XI.M26, "Fire Protection," with an exception and enhancements as described below

Exception. The LRA states the following exception to the GALL Report program element:

Element: 4: detection of aging effects

Exception: The six-month periodicity listed in NUREG-1801 for the full CO_2 system functional test will be performed on a 24-month basis in accordance with the plant's current licensing basis.

The staff noted that the GALL Report recommends a six-month periodicity for the full CO_2 system functional test. The CLB for JAFNPP is to perform the full CO_2 system functional test on a 24-month basis in accordance with JAFNPP TRM Section 3.7.J. The 24-month CO_2 system functional test frequency is specified in the JAFNPP Fire Protection Program and was part of the original licensing basis until the fire protection limiting conditions for operation and surveillance requirements was removed from the technical specifications based on the GL 88-12, "Removal of Fire Protection Requirements from Technical Specifications," dated August 1988, and placed in the plant TRM.

The CO_2 fire suppression installed at the JAFNPP is based on the National Fire Protection Association (NFPA) 12, "Standard on Carbon Dioxide Extinguishing Systems," 1968 Edition (Code of Record). The NFPA 12, 1968 Edition did not specify any frequency for the CO_2 fire suppression system functional test. The surveillance frequency for the CO_2 fire suppression system to perform functional test provided in the GALL Report is based on the current NFPA 12.

In addition, the staff noted that the applicant currently performs quarterly (92 days) CO_2 fire suppression system valve position check and operational tests and monthly CO_2 fire suppression system storage tank level and pressure checks. JAFNPP maintenance procedures 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 CO_2 fire suppression system.

The 24-month CO_2 fire suppression functional test frequency is part of the CLB and the review of JAFNPP operating experience indicated that this frequency is reasonable to manage the aging effects. The 24-month frequency is considered sufficient to ensure system availability and operability based on the plant operating history, and 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 concluded that the 24-month inspection interval will be sufficient to detect aging of CO_2 fire suppression system. The CO_2 fire suppression systems and components are in an inside air (external) environment, bolting, coil nozzles, piping and supports, tubing, fittings, valves, and tanks in an inside air (external) environment. The staff found that the applicant had demonstrated that the effects of aging CO_2 fire suppression system will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). On these bases, the staff finds this exception acceptable.

Enhancements. The LRA states that the following enhancements to the GALL Report program elements prior to the period of extended operation:

Enhancement 1

Elements:	1: scope of program 3: parameters monitored/inspected 4: detection of aging effects 5: monitoring and trending 6: acceptance criteria
Enhancement:	The Fire Protection Program will be enhanced to inspect fire barrier walls, ceilings, and floors at least once every refueling outage. Inspection results will be acceptable if there are no visual indications of degradation such as cracks, holes, spalling, or gouges.

The staff determined that this enhancement is acceptable because when the enhancement is implemented, Fire Protection Program elements "scope of program," "parameters monitored/inspected," " monitoring and trending," and "acceptance criteria," will be consistent with GALL AMP XI.M26 elements "scope of program," "parameters monitored/inspected," " monitoring and trending," and "acceptance criteria," which state that the inspection of fire barrier walls, ceilings, and floors at least once every refueling outage and the inspection results will be acceptable if there are no visual indications of degradation such as cracks, holes, spalling, or gouges. The applicant identified this enhancement as Commitment No. 5 (JAFP-06-0109, dated July 31, 2006).

Enhancement 2

Element:	4: detection of aging effects
Enhancement:	The Fire Protection Program will be enhanced to inspect at least one seal of each type every 24 months.

The staff noted that this enhancement did not meet the GALL guidance. Specifically, GALL AMP XI.M26, "detection of aging effects" element states that approximately 10 percent of each type of seal should be visually inspected at least once every refueling outage.

During the audit and review, the staff asked the applicant whether the seal inspection covers 10 percent of each type of seal in accordance with AMP XI.M26, "Detection of Aging Effects" element. In its response dated April 6, 2007, the applicant revised the above enhancement to state that the fire protection program will be enhanced to verify that each seal type is included in the 10 percent sample inspected every 24 months.

The staff determined that this enhancement is acceptable because when the enhancement is implemented, Fire Protection Program element "detection of aging effects" will be consistent with GALL AMP XI.M26 "detection of aging effects" element which states that approximately 10 percent of each type of seal should be visually inspected at least once every refueling outage (2 years).

The applicant identified this enhancement as Commitment No. 5. The staff is adequately assured that the AMP for penetration seals used for fire barriers will be considered appropriately during plant aging management activities.

Enhancement 3

Element:	4. detection of aging effects
Enhancement:	The Fire Protection Program will be enhanced to include periodic inspection of diesel-driven fire pump exhaust system components. These inspections will identify cracking through the use of visual or other NDE techniques.

The staff determined that this enhancement is acceptable because when the enhancement is implemented, Fire Protection Program element "detection of aging effects," will be consistent with GALL AMP XI.M26.

On this basis, the staff found this enhancement acceptable since when the enhancement is implemented, the Fire Protection Program will be consistent with GALL AMP XI.M26 and will provide additional assurance that the effects of aging will be adequately managed. The applicant identified this enhancement as Commitment No. 5.

Operating Experience. LRA Section B.1.13.1 states that inspections of fire stops, fire barrier penetration seals, fire barrier walls, ceilings, and floors from 2000 through 2004 detected such signs of degradation as cracks, gaps, voids, holes, or missing material. Visual inspections and functional tests of fire doors from 2000 through 2004 detected degradation of fire doors such as corrosion, wear, and missing parts. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing loss of material for fire barrier components and doors. The diesel-driven fire pump was observed while running in June 2005. No leaks or degradation of diesel engine subsystems, including the fuel supply line, were noted. Continual monitoring makes the program effective for managing aging of diesel-driven fire pump subsystem components.

The applicant also stated in the LRA that QA audits and surveillances in 2002 and 2003 revealed that the material condition of system equipment was good and met licensing

requirements. The audits and surveillances revealed no issues or findings with impact on program effectiveness to manage aging effects for fire protection components. In March 2005 the NRC completed a triennial fire protection team inspection to assess whether the plant had implemented an adequate Fire Protection Program and whether post-fire safe shutdown capabilities have been established and properly maintained. Results confirmed that plant personnel had maintained the fire protection systems in accordance with their Fire Protection Program, identified program deficiencies, and implemented appropriate corrective actions. The team also evaluated the material condition of fire area boundaries, fire doors, and fire dampers and concluded that plant personnel had maintained passive features in a state of readiness.

The staff reviewed the above operating experience and also operating experience reports and interviewed the applicant's technical staff and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience. The staff also reviewed the JAFNPP condition reports associated with the corrective actions taken for the identification of signs of degradation of fire protection components. The staff confirmed that the CRs were closed out by repairs to the degraded fire barriers or performed adequate engineering evaluations for their acceptability. The staff noted that the applicant performs periodic inspections and placed identified deficiencies into their corrective action program to ensure appropriate corrective actions are performed in a timely manner.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Fire Protection 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.13, the applicant provided the UFSAR supplement for the Fire Protection Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, February 1, 2007, and confirmed that the program enhancements are identified as Commitment No. 5, to be implemented before the period of extended operation.

The staff determines that the information in the UFSAR supplement provides 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 finds those program elements, for which the applicant claimed consistency with the GALL Report, are consistent. In addition, the staff reviewed the exception and the associated justification, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary

description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.12 Fire Water System Program

Summary of Technical Information in the Application. LRA Section B.1.13.2 describes the existing Fire Water System Program as consistent, with exceptions and enhancements, with GALL AMP XI.M27, “Fire Water System.”

The applicant states that the program applies to water-based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, above-ground and underground piping, and components tested in accordance with applicable NFPA codes and standards. Such testing assures functionality of systems. Many of these systems are normally maintained at required operating pressure and monitored to detect leakage causing loss of system pressure immediately and to initiate corrective actions. In addition, periodic wall thickness evaluations of fire protection piping on system components use non-intrusive techniques (e.g., volumetric testing) to find evidence of loss of material due to corrosion. A sample of sprinkler heads will be inspected in accordance with the guidance of NFPA 25 (2002 edition) Section 5.3.1.1.1, which states that “where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing.” NFPA 25 also has guidance for sampling every 10 years after initial field service testing.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the Fire Water System Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M27.

During the audit and review, the staff noted from the LRA’s review that there was no aging management program for water storage tanks as described in the Program Description of GALL AMP XI.M27. The staff interviewed the JAFNPP technical staff, reviewed piping and instrumentation diagram and the JAFNPP License Renewal Project Aging Management Program Evaluation Report. The staff confirmed from the interviews and documentation reviews that the plant does not utilize water storage tanks for fire protection. The fire water source is direct from Lake Ontario. Therefore, the staff determined that the applicant does not require any AMPs.

The staff also noted from the LRA review that fire hydrants and sprinklers were excluded from the AMP for the Fire Protection - Water System.

During the audit and review, the staff discussed this issue with the applicant’s fire protection personnel and asked the applicant why fire hydrants and sprinklers were excluded from the AMP. The applicant stated that fire hydrants are subject to an AMR and are included in the component type ‘valve body’ in LRA Table 3.3.2-5. Sprinkler heads also in LRA Table 3.3.2-5 are subject to an AMR and are included in the component type ‘nozzle’. The staff determined that the applicant’s response is acceptable because the fire hydrants and sprinkler heads are

identified in LRA Table 3.3.2-5, subject to an AMR, and adequately managed by the AMP for the Fire Water System.

During the audit and review, the staff also questioned the applicant concerning a statement in LRA Section B.1.13.2 that stated “many of these systems are normally maintained at required operating pressure and monitored.” The use of the phrase ‘many of these’ in the statement infers that there are some fire water systems that are not normally maintained at required operating pressures. The applicant stated that deluge, dry pipe and preaction sprinkler systems are normally dry and will only fill with water when a fire is detected. The fire hose standpipe located in the motor generator fan room is normally maintained dry due to the potential for freezing. If needed, the standpipe is filled and pressurized by use of a local valve. The staff determined that the applicant’s response was acceptable because some systems are maintained dry until activated via fire detection instrumentation or the opening of a manual valve.

The staff questioned the applicant about the lack of an AMP for the water foam system. In its response, the applicant stated that the water foam system is a subsystem of the fire water system and is described in LRA Table 3.3.2 (environment - fire protection foam). Since the aging effects of the fire protection foam system is more conservative than that of raw water and the applicant manages the aging effects of this system with the Fire Water System Program AMP, the staff concluded that the aging effects of the water foam system are adequately maintained.

The staff finds the applicant’s Fire Water System Program acceptable because it conforms to the recommended GALL AMP XI.M27, “Fire Water System,” with the exception and enhancements as described below.

Exception 1. The LRA states an exception to the following GALL Report program element:

> Element: 3: parameters monitored/inspected
>
> Exception: NUREG-1801 specifies that periodic flow testing of the fire water system is performed using the guidelines of NFPA 25. Under the JAFNPP program, this test is performed in accordance with section 11, Chapter 5 of the Fire Protection Handbook, 14^{th} Edition, published by the National Fire Protection Association.

The LRA states the following note to this exception:

> Using of the fire Protection Handbook, 14^{th} Edition, published by the National Fire Protection Association, is an appropriate application of industry standards to ensure no loss of function of this system.

The LRA states that the periodic flow testing of the fire water system is performed in accordance with the guidelines of Section 11, Chapter 5 of the Fire Protection Handbook instead of the guidelines of NFPA 25, as recommended by the GALL Report. The staff reviewed both of these documents and surveillance requirement TRS 3.7.H.18 of the TRM. The staff also interviewed the applicant’s fire protection engineers. The staff determined that the

extent of the testing requirements, the acceptance criteria and the analysis of the test data outlined in Section 11, Chapter 5 of the NFPA Fire Protection Handbook followed the guidance provided in NFPA 25. Overall, staff noted that the NFPA Fire Protection Handbook periodic water flow testing follows the NFPA 25 recommendations and is adequate to assess the ability of the system to perform its intended function. Therefore, staff finds this exception acceptable.

Exception 2. The LRA states an exception to the following GALL Report program element:

> Element: 4: detection of aging effects
>
> Exception: NUREG - 1801 specifies annual fire hydrant hose hydrostatic test. However, the hoses are not subject to aging management since they are periodically inspected, hydrotested, and replaced.

The LRA states the following note to this exception:

> Table 2.1-3 of NUREG - 1800 Rev. 1 provides for the exclusion of fire hoses from aging management review based on their short-lived nature.

During the audit and review, the staff asked the applicant to clarify the CLB for the fire hydrant tests at JAFNPP.

In its response, the applicant stated that "inspection, testing, and replacement of fire hoses are conducted in accordance with JAFNPP TRM, Rev. 12, at least once every 18 months (24 months in high radiation areas) and that hydrostatic tests are performed at least once every 36 months (48 months in high radiation areas). As stated in LRA Section 2.1.2.4.4, replacements occur based on the results of inspections and testing." Also, the applicant stated that the LRA excluded fire hoses from an AMR since they are periodically inspected, hydro-tested, and replaced. In LRA Amendment No. 5 dated February 1, 2007 (ML070440127), the applicant clarified LRA Section B.1.13.2, note 2, to the exception to state " Fire hoses are replaced based on periodic performance or condition monitoring and are excluded from an AMR per SRP-LR Table 2.1-3, Revision 1." The staff reviewed the applicant's response and determined that this exception is acceptable because the applicant meets the requirements specified in TRM Section 3.7.K and Q for the fire hydrant hose hydrostatic test and the plant-specific operating experience indicates no aging-related events adversely affecting system operation. The staff found these frequencies to be reasonable and adequate to manage the aging effects. Also, the staff determined that since hoses are replaced based on performance or condition monitoring, this meets the criteria of SRP-LR Section 2.1.3.2.2. The staff is adequately assured that the hydrostatic test for fire hoses to manage the aging effects will be considered appropriately during plant aging management activities.

Exception 3. The LRA states an exception to the following GALL Report program element:

> Element: 4: detection of aging effects
>
> Exception: NUREG - 1801 specifies annual gasket inspections. Under the JAFNPP program, visual inspection, re-racking and replacement of gaskets in couplings occurs at least once per operating cycle

(every 24 months in high radiation areas).

The LRA states the following note to this exception:

> Since aging effects are typically manifested over several years, differences in inspection and testing frequencies are insignificant.

LRA exception for Detection of Aging Effects Program element states that visual inspection, re-racking and replacements of gaskets in couplings occurs at least once per operating cycle (24 months). The GALL Report recommends an annual inspection frequency. During the audit and review, the staff asked the applicant the basis for the proposed frequency. In its response, the applicant stated that gaskets in Fire Water components were excluded from Detection of Aging Effects Program element as an exception to the GALL Report because they are treated as consumables per the GALL Report guidelines and are not subject to an AMR. In its response dated February 1, 2007 (Amendment No. 5), the applicant revised the exception to state:

> Gaskets are not subject to an AMR since they are periodically inspected, tested and replaced.
>
> Note 3: Gaskets are replaced based on performance or condition monitoring and are excluded from aging management review per Table 2.1-3 of NUREG-1800 Rev. 1.

The applicant also stated that the inspection and replacement of gaskets are conducted per JAFNPP TRM, Revision 12, at least once every 18 months (24 months in high radiation areas). Also, as stated in LRA Section 2.1.2.4.4, replacements occur based on the results of inspections and testing. The staff reviewed the applicant's response and determined that the exception is consistent with TRM Sections 3.7.K and Q. In addition, a review of the operating experience did not reveal any age-related failures, since gaskets are consumable and periodically inspected, tested, and replaced. Also, the staff determined that since hoses are replaced based on performance or condition monitoring, this meets the criteria of SRP-LR Section 2.1.3.2.2. The staff found these frequencies to be reasonable and adequate to manage the aging effects.

The applicant’s LRA for the Fire Water System Program stated that the following enhancements:

Enhancement 1. The LRA states an enhancement to the following GALL Report program elements:

Elements:	3: parameters monitored/inspected 6: acceptance criteria
Enhancement:	Procedures will be enhanced to include inspection of hose reels for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.

The staff found the enhancements to "parameters monitored/inspected," and "acceptance criteria" program elements to be acceptable because when the enhancements are implemented, Fire Water System Program will be consistent with GALL AMP XI.M27 and will adequately manage the effects of aging (Commitment No. 6 (JAFP-06-0109, dated July 31, 2007)).

Enhancement 2. The LRA states an enhancement to the following GALL Report program elements:

Elements:	3: parameters monitored/inspected 6: acceptance criteria
Enhancement:	Procedures for sprinkler systems will be enhanced to include visual inspection of spray and sprinkler system internals for evidence of corrosion. Acceptance criteria will be enhanced to verify no significant corrosion.

The staff found the enhancements to"parameters monitored/inspected," and "acceptance criteria" program elements to be acceptable because when the enhancements are implemented, the Fire Water System Program will be consistent with GALL AMP XI.M27 and will adequately manage the effects of aging (Commitment No. 6).

Enhancement 3: The LRA states an enhancement to the following GALL Report program element:

Element:	4: detection of aging effects
Enhancement:	A sample of sprinkler heads will be inspected using guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1. NFPA 25 also contains guidance to repeat this sampling every 10 years after initial field service testing (Commitment No. 6).

The staff found the enhancements to "detection of aging effects" program element to be acceptable because when the enhancements are implemented, the Fire Water System Program will be consistent with GALL AMP XI.M27 and will adequately manage the effects of aging.

Enhancement 4. The LRA states an enhancement to the following GALL Report program element:

Element:	4: detection of aging effects
Enhancement:	Wall thickness evaluations of fire protection piping will be performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term

and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function (Commitment No. 6).

The staff found the enhancements to "detection of aging effects" program element to be acceptable because when the enhancements are implemented, the Fire Water System Program will be consistent with GALL AMP XI.M27 and will adequately manage the effects of aging.

Operating Experience. LRA Section B.1.13.2 states that visual inspections of fire hose station equipment in October 2005 detected no loss of material on steel parts. In the past, fire hose station angle valves have been replaced due to corrosion. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing aging effects for steel fire water system components. Full-flow tests of fire main segments and hydrant inspections from 2003 through 2005 found no evidence of obstruction or loss of material. Spray and sprinkler system functional tests and visual inspections of piping and nozzles from 2004 through 2006 found no evidence of blockage or loss of material, proving that the program is effective for managing loss of material for fire water system components. QA audits and surveillances in 2002 and 2003 revealed that the material condition of system equipment was good and met licensing requirements. The audits and surveillances revealed no issues or findings with impact on program effectiveness to manage aging effects for fire protection components. In March 2005, NRC completed a triennial fire protection team inspection to assess whether the plant had implemented an adequate fire protection program and whether post-fire safe shutdown capabilities had been established and properly maintained. Results confirmed that plant personnel had maintained the fire protection systems in accordance with their fire protection program, identified program deficiencies, and implemented appropriate corrective actions. The team also reviewed fire detection and suppression surveillance procedures and concluded that plant personnel had maintained passive features in a state of readiness.

The staff reviewed the operating experience review results and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience. The staff noted that none of the condition reports identified as aging-related involved components related to the Fire Water system.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s Fire Water System 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.14, the applicant provided the UFSAR supplement for the Fire Water System Program. The staff determined during its review of the Fire Water

System Program that the enhancement for revising procedures to include inspections of hose reels for corrosion is not addressed in Appendix A. For additional clarification the applicant stated that LRA Appendix A will be revised. In its response dated February 1, 2007, the applicant submitted Amendment 5 to the LRA which added the program enhancements to LRA Section A.2.1.14, "Fire Water System Program."

The staff determines that the information in the UFSAR supplement provides 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 finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exceptions and the associated justifications, and determined that the AMP, with the exceptions, is adequate to manage the aging effects for which it is credited. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.13 Metal-Enclosed Bus Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.17 describes the new Metal-Enclosed Bus Inspection Program as consistent, with exception, with GALL AMP XI.E4, "Metal Enclosed Bus."

Under the Metal-Enclosed Bus Inspection Program, internal portions of the non-segregated phase bus T2Y and T3Y components will be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of water intrusion. Bus insulation will be inspected for signs of embrittlement, cracking, melting, swelling, or discoloration, which may indicate overheating or aging degradation. Internal bus supports will be inspected for structural integrity and signs of cracks. Bolted connections are covered with heat-shrink tape or insulating boots per manufacturer's recommendations, so a sample of accessible bolted connections will be visually inspected for insulation material surface anomalies. Enclosure assemblies will be visually inspected for evidence of loss of material and, where appropriate, enclosure assembly elastomers will be visually inspected and manually flexed to manage cracking and change in material properties. The program will be implemented fully prior to the period of extended operation.

Staff Evaluation. During its audit and review, the staff reviewed exception to determine whether the AMP, with the exception, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical staff and reviewed the Metal-Enclosed Bus Inspection Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.E4.

During the audit and review, the staff noted that LRA Section B.1.17 states that “where applicable, enclosure assembly elastomers will be visually inspected and manually flexed to manage cracking and change in material properties.” The GALL Report recommends inspecting the elastomers. The staff requested the applicant to clarify it intended to inspect the enclosure assembly elastomer and if it did, remove the phrase “as applicable” and if it did not, provide a justification of why the elastomer is not subject to aging.

In its response, the applicant stated that enclosure assembly elastomers will be inspected. The applicant would revise the LRA and program basis document to remove the wording “where applicable.” In its response dated February 1, 2007, the applicant revised LRA Section B.1.17 to reflect this change.

Section 54.4(a)(3) of 10 CFR requires that “All systems, structures, and components relied on in safety analyses or plant evaluation to perform function that demonstrate compliance with the Commission’s regulation for station blackout (10 CFR 50.63)” be included within the scope of license renewal. The staff noted that JAFNPP Updated Final Safety Evaluation Report (UFSAR) Section 8.2.1 states that “an alternate source of ac power, from the 345 kilo-volt (kV) system is available to provide power to plant auxiliaries during plant shutdown. The power is supplied to plant 4.16kV emergency buses by back feeding from the 345kV system via main transformer, isolated phase bus duct, and the normal station service transformer.” Since back feeding is identified as a qualified alternate source for restoration of ac power to 4.16kV safety buses, the staff requested the applicant to provide a technical justification for why the alternate ac source to 4.16kV safety buses from the 345kV system is not included within the scope of license renewal and does not need an AMP.

In its response, the applicant stated that:

> The three sources of normal ac power for JAFNPP are the normal, reserve, and emergency sources. The normal source is the Normal Service Station Transformer (NSST) 71T-4. The reserve source is the Reserve Service Station Transformers (RSST)-2 and 71T-3. The emergency source is the emergency diesel generators. In UFSAR Section 8.3, the 115kV system has the safety objective to provide a supply of offsite power for the engineered safeguard loads. The 115kV system has the power generation objective to provide two sources of offsite ac power to the plant service ac power distribution system for plant startup, operating and shutdown power including adequate power to the emergency service buses for the safe shutdown of the reactor. The 115kV bus at JAFNPP is energized from two 115kV from two 115kV transmission lines as shown in UFSAR Figure 8.3-2. This provides the General Design Criteria (GDC)-17 criteria for the RSST. Section 8.11 of the UFSAR addresses Station Black Out (SBO). SBO is defined in 10 CFR 50.2 as a complete loss of ac electric power to essential and non-essential switchgear buses. Offsite power is assumed to be lost concurrently with a main turbine trip and unavailability of the on-site emergency ac power system. SBO does not include loss of ac power to buses fed by the station batteries through inverters and does not assume a concurrent single failure or design basis accident. Section 8.2.1 of the UFSAR, states that “an alternate source of ac power, from the 345kV system, is available to provide power to plant auxiliaries during plant shutdown. The power is

supplied to plant 4.16kV buses by back feeding from the 345kV system via main transformers, isolated phase bus duct, and the NSST. The main generator is isolated by removing the isolated phase bus duct disconnect links." This alternate source is only used during outages for maintenance on the RSST. This source of offsite ac power is not credited for recovery from SBO. The two sources of offsite ac power is the two independent 115kV lines that feed the RSST. There is a cross feed circuit that can be closed to provide power to both of the 4.16kV safety buses in the plant in the case of loss of one 115kV line. This cross-tie can be closed in less than ten minutes when needed. This source will be much faster than installing the feedback source which take at least 12 hours. No other source is needed or required.

The staff finds the applicant's response acceptable because back feeding from 345kV is not credited for SBO offsite recovery. The two 115kV buses which are energized from independent 115kV transmission lines provide power to the 4.16kV safety buses during startup, shutdown, and SBO recovery. There is also a cross feed circuit that can be closed to provide power of both of the 4.16kV safety buses in the case of loss of one 115kV line. An alternate source of ac power back feeding from the 345kV system is not credited for SBO offsite recovery and therefore, an AMP is not required.

The staff concludes that the applicant's Metal-Enclosed Bus Inspection Program provides assurance that aging effects of metal enclosed bus caused by cracked insulation, moisture, debris in the bus enclosure, and loosening of bolted connections will be managed consistent with CLB during the period of extended operation. The staff finds the applicant's Metal-Enclosed Bus Inspection Program acceptable because it conforms to the recommended GALL AMP XI.E4, "Metal-Enclosed Bus," with an exception as described below.

Exception. The LRA states an exception to the following GALL Report program elements:

Elements: 3: parameters monitored/inspected
4: detection of aging effects

Exception: MEB enclosure assemblies will be inspected under this program instead of under the Structure Monitoring Program.

The applicant stated in the LRA, under Exception Note 1, that inspection of MEB enclosure under the Metal-Enclosure Bus Inspection Program assures that effects of aging will be identified prior to loss of intended functions.

GALL Report, Revision 1, Section VI, Items VI.A-12 and VI-13) refers to the Structure Monitoring Program for inspecting the external of MEB for loss of material due to general corrosion and inspecting the enclosure seals for hardening and loss of strength due to elastomers degradation. In LRA, Section B.1.17, the applicant stated that the program attribute of MEB inspection program would be consistent with the program attribute in GALL Report Section XI.E4, with an exception. The exception is to inspect MEB enclosure assemblies in addition to internal surfaces using the MEB inspection program. The staff found the exception acceptable because external of MEB and enclosure seals will be inspected in the MEB Inspection program. These inspections are consistent with the GALL Structure Monitoring

Program.

Operating Experience. LRA Section B.1.17 states that the Metal-Enclosed Bus Inspection Program is a new program. Industry operating experience will be considered in the development of this program. Industry operating experience that forms the basis for the program is described in the operating experience element of the GALL Report program description. Plant-specific operating experience is consistent with the operating experience in the GALL Report program description. This program will provide reasonable assurance of management of aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extend operation. With additional operating experience, lessons learned can be used to adjust the program as needed.

The staff also interviewed the applicant's technical staff and also reviewed the operating experience reports and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Metal-Enclosed Bus 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.19, the applicant provided the UFSAR supplement for the Metal-Enclosed Bus Inspection Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that this new program is identified as Commitment No. 8 (JAFP-06-0109, dated July 31, 2006) to be implemented before the period of extended operation.

The staff determines that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant's Metal-Enclosed Bus Inspection Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 8, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.14 Oil Analysis Program

Summary of Technical Information in the Application. LRA Section B.1.20 describes the existing Oil Analysis Program as consistent, with exception and enhancements, with GALL AMP XI.M39, “Lubricating Oil Analysis.”

The Oil Analysis Program maintains oil systems free of contaminants to preserve an environment not conducive to loss of material, cracking, or fouling. Sampling frequencies are based on vendor recommendations, accessibility during plant operation, equipment importance to plant operation, and previous test results.

Staff Evaluation. During its audit and review, the staff reviewed the 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 the Oil Analysis Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M39.

The staff finds the applicant’s Oil Analysis Program acceptable because it conforms to the recommended GALL AMP XI.M39, “Oil Analysis Program,” with the exception and enhancements as described below.

Exception. The LRA states an exception to the following GALL Report program element:

> Element: parameters monitored/inspected
>
> Exception: flash point is not determined for sampled oil.

The applicant’s note on this exception provides the following clarifications:

> Analyses of filter residue or particle count, viscosity, total acid/base (neutralization number), water content, and metals content provide sufficient information to verify the oil is suitable for continued used.

During the audit and review, the staff questioned the applicant concerning the basis for the exception to the GALL Report for the flash point determination of industrial lubricants used in components subject to hydrocarbon buildup that do not have regular oil changes. The aging management component in this category at JAFNPP is the diesel fire pump engine. The staff reviewed maintenance and chemistry documents for this component. This review revealed that a flash point reading of the engine lubricant is taken annually with an engine oil change of every six years. The lubricating oil in the engines of the security backup generator and the emergency diesel generator are changed on a regular basis and do not fall within the guidelines of this section of the GALL Report. This issue was discussed with the applicant’s technical staff and the applicant committed to amending the LRA to remove this exception. In its response dated February 1, 2007, the applicant revised the LRA Section B.1.20 to delete this exception. The staff finds the applicant's action acceptable because flash point is determined for sampled oil as described in the GALL Report and the applicant is not taking any exceptions to GALL

AMP XI.M39.

The applicant stated in LRA that the following enhancements will be implemented in meeting the GALL Report program elements prior to the period of extended operation and these enhancements are identified as Commitment No. 5 in LRA Amendment 5, dated February 1, 2007:

Enhancement 1. The LRA states an enhancement to the following GALL Report program element:

Element:	1: scope of program
Enhancement:	The Oil Analysis Program guidance documents will be enhanced to periodically sample lubricating oil in the underground oil filled cable, the security generator, and the fire pump diesel.

The staff found this enhancement acceptable because when enhancements are implemented, the Oil Analysis Program, "scope of program" program element will be consistent with GALL AMP XI.M39 and provide additional assurance that the effects of aging will be adequately managed (Commitment No. 11 (JAFP-06-0109, dated July 31, 2007).

Enhancement 2. The LRA states an enhancement to the following GALL Report program element:

Element:	3: parameters monitored/inspected
Enhancement:	The Oil Analysis Program guidance documents will be enhanced to include viscosity and neutralization number determination of oil samples from components that do not have regular oil changes.

The staff found this enhancement acceptable because when enhancements are implemented, the Oil Analysis Program, " parameters monitored/inspected" program element will be consistent with GALL AMP XI.M39 and provide additional assurance that the effects of aging will be adequately managed (Commitment No.11).

Enhancement 3. The LRA states an enhancement to the following GALL Report program element:

Element:	3: parameters monitored/inspected
Enhancement:	The Oil Analysis Program guidance documents will be enhanced to include particulate and water content for oil replaced periodically.

The staff found this enhancement acceptable because when enhancements are implemented, the Oil Analysis Program,"parameters monitored/inspected" program element will be consistent

with GALL AMP XI.M39 and provide additional assurance that the effects of aging will be adequately managed (Commitment No. 11).

Operating Experience. LRA Section B.1.20 states that the high-pressure coolant injection (HPCI) lube oil sump suffered from water intrusion from March 2001 until February 2005 because valve 23MOV-14 was inadequate for steam service. During that time, the oil was monitored monthly and water was drained from the oil sump as necessary to keep the system as water-free as possible. Results of particle count, viscosity, and additive metal depletion analyses found no evidence of water, emulsion, or contaminant carry-over to the operating oil system. Recent quarterly sampling results show water and particulates within acceptance criteria. In 2004, a few non-magnetic metallic wear particles were found on the EDG “D” lube oil filter screens. The quantity was not large enough for elemental analysis of material composition. EDG “D” oil sample particle counts at the time were in the normal range, indicating that particles had been captured in the 40 mesh filters and not entered the operating oil system. Corrective action was taken to schedule filter inspections during subsequent diesel maintenance activities to capture particles for analysis to determine material composition and possible sources. Continuous confirmation of oil quality and timely corrective actions prove that the program is effective in managing aging effects for lube oil components.

The staff reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience. The staff also reviewed four condition reports for the Oil Analysis Program. These reports addressed the operating experience problems with HPCI lube oil sump water intrusion and metallic wear particles found on the EDG D lube oil filter screen. In cases where contaminant levels were exceeded, corrective actions included resampling or replacement of lube oil and/or filter and increased frequency of surveillance. The staff determined that the applicant took appropriate corrective actions to prevent and correct these problems.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s Oil Analysis 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.22, the applicant provided the UFSAR supplement for the Oil Analysis Program. The staff reviewed the applicant’s license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the program enhancements are identified as Commitment No. 11 to be implemented before the period of extended operation.

The staff determines that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant’s Oil Analysis Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL

Report are consistent. In addition, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.15 Reactor Head Closure Studs Program

Summary of Technical Information in the Application. LRA Section B.1.23 describes the Reactor Head Closure Studs Program as an existing program that is consistent, with the program attributes of GALL AMP XI.M3, "Reactor Head Closure Studs," with one exception.

The applicant stated that this program includes ISI per the requirements of ASME Section XI, Subsection IWB, and preventive measures (e.g. rust inhibitors, stable lubricants, appropriate materials) to mitigate cracking and loss of material of reactor head closure studs, nuts, washers, and bushings.

Staff Evaluation. During its audit and review, the staff reviewed the exception to determine whether the AMP, with the exception, remains adequate to manage the aging effects for which it is credited.

The staff interviewed the applicant's technical staff and reviewed the Reactor Closure Head Studs Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M3.

With the exception discussed and evaluated below, the staff finds the applicant's program includes all ASME Code, Section XI inspection requirements for the RV closure studs and closure flange and is consistent with the additional recommendation provided in the GALL Report for the RV closure flange assembly, including the studs, flange, nuts, bushings, and washers.

The staff finds the applicant's Program acceptable because it conforms to the recommended GALL AMP XI.M3, "Reactor Head Closure Studs," with the exception as described below.

Exception. The LRA states an exception to the GALL Report program element "detection of aging effects." Specifically, the exception states:

> When reactor head closure studs are removed for examination, either a surface or volumetric examination is allowed

The staff noted that the applicant entered the 4th 10-Year ISI Interval for JAFNPP in January 2007. The applicant was required by 10 CFR 50.55a(g)(4)(I) to update the ASME Code, Section XI (Section XI code of record) to the 2001 Edition of Section XI, inclusive of the 2003 Addenda. The staff requested confirmation from the applicant that the Section XI code of record for the 4th 10-Year ISI Interval is the 2001 Edition of Section XI, inclusive of the 2003

Addenda. The applicant clarified in its response that the exception in this AMP on the Section XI code edition is applicable to the 3rd 10-Year ISI Interval for JAFNPP. The applicant also clarified that the new Section XI Code of record for the 4th 10-Year ISI Interval is the 2001 Edition of Section XI, inclusive of the 2003 Addenda. The applicant stated that the LRA will be amended to indicate that the 2001 Edition of Section XI, inclusive of the 2003 Addenda is the applicable edition of Section XI. The applicant amended the LRA in Amendment No. 5, dated February 1, 2007.

The Section XI, Examination Category B-G-1, Inspection Item B6.30 provides the 10-Year Interval ISI requirements for inspecting the RV closure studs when the studs are removed. In the 2001 Edition of Section XI, inclusive of the 2003 Addenda, Inspection B6.30 requires either a volumetric examination or surface examination of all of the closure studs each 10-Year ISI Interval. The 4th 10-Year ISI Interval for JAFNPP will be the 10-Year interval in effect if the LRA for JAFNPP is approved by the staff. In its exception to the GALL Report, the applicant has proposed to perform either a volumetric examination or a surface examination of the RV closure studs when they are removed. This is in compliance with the requirements of Inspection Item B6.30 in the 2001 Edition of Section XI, which is the edition of record required for JAFNPP's 4th 10-Year ISI Interval.

Based on this assessment, the staff concludes that the exception taken by the applicant on examination of the RV closure studs in the removed status for the studs is acceptable because the inspection requirements are in compliance with the requirements of Examination Category B-G-1, Inspection Item B6.30 in the 2001 Edition of Section XI.

<u>Operating Experience</u>. LRA Section B.1.23 states that volumetric examination of 30 reactor head closure studs in 1990 recorded no indications. Absence of recordable indications proves that the program is effective for managing loss of material and cracking of the reactor head closure studs, nuts, and washers

The staff interviewed the applicant's personnel and reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for components within the scope of this program that are not bounded by industry operating experience. A review of the condition reports shows that cracking of the head studs from stress corrosion cracking (SCC), IGSCC, and loss of material due to wear has not occurred. The staff also confirmed that the 2006 refueling outage reactor head closure studs examinations did not identify any indications.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Reactor Head Closure Studs 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. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.25, the applicant provided the summary description for the Reactor Head Closure Studs Program. The staff reviewed LRA Section A.2.1.25 and compared it to the corresponding UFSAR Supplement description for Reactor Head Closure

Stud Programs in SRP-LR Table 3.1-2.

The staff determines that the information in the UFSAR supplement provides 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 finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.16 Reactor Vessel Surveillance Program

Summary of Technical Information in the Application. The applicant provided the following description of the Reactor Pressure Vessel AMP in LRA Section B.1.24:

> Program Description
>
> The Reactor Vessel Surveillance Program complies with the guidelines for an acceptable Integrated Surveillance Program as described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance. This program manages reduction in fracture toughness of reactor vessel beltline materials to assure that the pressure boundary function of the reactor pressure vessel is maintained for the period of extended operation.
>
> JAFNPP has applied to use the BWR (boiling-water reactor) vessel and internals project (BWRVIP) Integrated Surveillance Program (ISP) and expects staff approval well before the period of extended operation. The Reactor Vessel Surveillance Program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel (RPV) beltline region. As BWRVIP-ISP capsule test reports become available for RPV materials representative of JAFNPP, the actual shift in the reference temperature for nil ductility transition of the vessel material may be updated. In accordance with 10 CFR 50 Appendices G and H, JAFNPP reviews relevant test reports to assure compliance with fracture toughness requirements and pressure-temperature limits. BWRVIP-116, "BWR Vessel and Internals Project Integrated Surveillance Program (ISP) Implementation for License Renewal," describes the design and implementation of the ISP during the period of extended operation. BWRVIP-116 identifies additional capsules, their withdrawal schedule, and contingencies to ensure that the requirements of 10 CFR 50 Appendix H are met for the period of extended operation.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program at JAFNPP is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance, with one enhancement.

Exceptions to NUREG-1801

None.

Enhancements

The following enhancement will be fully implemented prior to the period of extended operation.

Attributes Affected	Enhancement
5. Monitoring and Trending Actions 6. Acceptance Criteria 7. Corrective Actions	The Reactor Vessel Surveillance Program will be enhanced to proceduralize the data analysis, acceptance criteria, and corrective actions described in this program description, to meet the requirements of the ISP as found in BWRVIP-86-A, 102, 116, and 135.

Operating Experience

JAFNPP has committed to the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP). The fact that the plant participates in the BWRVIP ISP ensures that future OE from all participating BWRs will be factored into this program. Thus, the Reactor Vessel Surveillance Program provides reasonable assurance that the effects of aging will be managed such that the applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Conclusion

The Reactor Vessel Surveillance Program provides reasonable assurance that aging effects will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

Staff Evaluation. In LRA Section B.1.24, the applicant described its AMP to manage irradiation embrittlement of the RPV through testing that monitors RPV beltline materials. The LRA stated that the RPV surveillance program will be enhanced by making it consistent with the BWRVIP ISP for periods of extended operation prior to the JAFNPP entering its period of extended operation.

In RAI B.1.24-3 dated January 12, 2007, the staff requested that the applicant provide information on whether it is currently implementing the BWRVIP ISP at JAFNPP. If so, the applicant was asked to reference the staff-approved license amendment request for implementing the ISP at JAFNPP.

In its response dated January 12, 2007, the applicant stated that it has implemented the BWRVIP ISP which is based on the BWRVIP-78 report, “BWR Integrated Surveillance Program Plan,” and the BWRVIP-86-A report, “BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation.” These reports are consistent with the GALL AMP XI.M31, “Reactor Vessel Surveillance,” for the period of the current JAFNPP license. The staff concluded that the BWRVIP ISP in the BWRVIP-78 and BWRVIP-86-A reports is acceptable for BWR licensee implementation, provided that all participating licensees use one or more compatible neutron fluence methodologies acceptable to the staff when determining surveillance capsule and RPV neutron fluences.

In its response dated February 12, 2007, the applicant stated that the staff’s final safety evaluation, dated July 26, 2006, for TS Amendment #285 was the staff’s SE for accepting the BWRVIP ISP for the current term at JAFNPP. The staff has identified this as a sub Open Item (sOI) for Open Item 4.2.1-1 which will be further discussed in SER Section 4.0.

The BWRVIP developed an updated version of the ISP which is documented in the BWRVIP-116 report. The report provides guidelines for an ISP to monitor neutron irradiation embrittlement of the RPV beltline materials for all U.S. BWR power plants for the license renewal period. The applicant stated in LRA Section B.1.24, and in the UFSAR Section A.2.1.26, “Reactor Vessel Surveillance Program,” that it will implement the ISP specified in the BWRVIP-116 report. The staff reviewed UFSAR Section A.2.1.26 to determine whether it provides an adequate description of the program.

In RAI B.1.24-1 dated January 12, 2007, the staff requested that the applicant make the following commitment in LRA Section B.1.24 and in LRA Section A.2.1.26:

> The BWRVIP-116 report which was approved by the staff will be implemented at JAFNPP with the conditions documented in Sections 3 and 4 of the staff’s final SE for the BWRVIP-116 report dated March 1, 2006.

In its response dated February 12, 2007, the applicant stated that UFSAR Section A.2.1.26 and LRA Section B.1.24 are being updated to include the aforementioned commitment proposed by the staff.

Based on its review, the staff finds the applicant’s response to RAI B.1.24-1 acceptable. Therefore, the staff’s concern described in RAI B.1.24-1 is resolved.

Part 50 of 10 CFR, Appendix H, requires that an ISP used as a basis for a facility's RPV surveillance program be reviewed and approved by the staff. The ISP to be used by the applicant is a program that was developed by the BWRVIP and the applicant will apply the BWRVIP ISP as the method by which the JAFNPP will comply with the requirements of 10 CFR Part 50, Appendix H. The BWRVIP ISP identifies capsules that must be tested to monitor neutron radiation embrittlement for all licensees participating in the ISP and identifies capsules that need not be tested (standby capsules). The BWRVIP-116 report, Table 3.3, indicates that the remaining capsule from JAFNPP is not to be tested. This untested capsule was originally part of the applicant's plant-specific surveillance program and has received significant amounts of neutron radiation.

In RAI B.1.24-2 dated January 12, 2007, the staff requested that the applicant include the following commitment in LRA Section A.2.1.26:

> If the JAFNPP standby capsule is removed from the RPV without the intent to test it, the capsule will be stored in manner which maintains it in a condition which would permit its future use, including during the period of extended operation, if necessary.

In its response dated February 12, 2007, the applicant stated that the staff's aforementioned commitment is being incorporated in LRA Section A.2.1.26.

Based on its review, the staff finds the applicant's response to RAI B.1.24-2 acceptable. Therefore, the staff's concern described in RAI B.1.24-2 is resolved.

Finally, as noted in Open Item 4.2.1-1, an issue remains to be solved regarding the applicant's RPV neutron fluence evaluation for the period of extended operation. As this fluence evaluation has an associated impact on the ability of the applicant to implement the staff-approved BWRVIP-116 report, the staff considers the resolution of Open Item 4.2.1-1 to be relevant to the closure of the staff's review of LRA Section B.1.24. Hence, the staff will identify Item B.1.24-3 as closed upon the resolution of Open Item 4.2.1-1, such that the JAFNPP RPV neutron fluence evaluation supports the implementation of the Reactor Vessel Surveillance Program.

On the basis of its review, the staff finds, pending the resolution of the open items noted above, that the applicant has demonstrated that the effects of aging due to loss of fracture toughness of the RPV beltline region will be adequately managed, so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff has identified this as sOI B.1.24-3 for Open Item 4.2.1-1 which will be further discussed in SER Section 4.0.

<u>Operating Experience</u>. LRA Section B.1.24 states a commitment to the BWRVIP ISP. Participation in the BWRVIP ISP will factor future operating experience from all participating BWRs into this program. Thus, the Reactor Vessel Surveillance Program provides reasonable assurance of management of the aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extended operation.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. The applicant described the reactor materials surveillance program as an existing program in LRA Section A.2.1.26. The program uses periodic testing of metallurgical surveillance samples to monitor the loss of fracture toughness of the RPV beltline region materials consistent with the requirements of 10 CFR Part 50, Appendix H. The applicant further stated that it will implement the staff-approved BWRVIP-116 report for the license renewal period. The BWRVIP-116 report was approved by the staff and, as described in the staff evaluation section, the applicant made a commitment to include the following statement in the LRA Section A.2.1.26:

> The BWRVIP-116 report which was approved by the staff will be implemented at JAFNPP with the conditions documented in Sections 3 and 4 of the staff’s final SE dated March 1, 2006, for the BWRVIP-116 report.

As to the status of the remaining JAFNPP standby capsule, the applicant made a commitment to incorporate the following statement in the LRA Section A.2.1.26:

> If the JAFNPP standby capsule is removed from the RPV without the intent to test it, the capsule will be stored in manner which would permit its future use, if necessary.

The staff reviewed the applicant’s proposed revision to UFSAR Section A.2.1.26 and determined that by implementing the most recent staff-approved version of the BWRVIP-116 report, the applicant demonstrated its compliance with the requirements of 10 CFR Part 50, Appendix H.

The staff’s review determined that the following license condition will be required to ensure that changes in the withdrawal schedule for the capsule specified in the BWRVIP-116 report will be submitted for staff review and approval.

> All capsules placed in storage must be maintained for future insertion. Any changes to storage requirements must be approved by the NRC, as required by 10 CFR Part 50, Appendix H.

The staff concluded that the information provided in the UFSAR Supplement for the aging management of systems and components discussed above is equivalent to the information in the GALL Report and therefore provides an adequate summary of program (pending, resolution of sOI B.1.24-3) activities 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 determined that those program elements for which the applicant claimed consistency with the GALL Report are consistent with the GALL Report. Also, the staff reviewed the enhancement and confirmed that implementation of the enhancement prior to the period of extended operation would result in consistency between the existing AMP and the GALL AMP to which it was compared.

The staff concluded that the applicant had demonstrated (pending completion of sOI B.1.24-3) that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement A.2.1.26 for this AMP and concluded that it provides (pending completion of the open item noted above) an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.17 Service Water Integrity Program

Summary of Technical Information in the Application. LRA Section B.1.26 describes the existing Service Water Integrity Program as consistent, with exception, with GALL AMP XI.M20, "Open-Cycle Cooling Water System."

This Service Water Integrity Program relies on implementation of the recommendations of GL 89-13 to manage the aging effects on the service water system (SWS) for the period of extended operation. The SWS includes the normal service water, emergency service water (ESW), and residual heat removal service water (RHRSW). The program inspects components for erosion, corrosion, and blockage and monitors performance to verify the heat transfer capability of the safety-related heat exchangers cooled by service water. Chemical treatment with biocides and chlorine and periodic cleaning and flushing of redundant or infrequently used loops control or prevent fouling within the heat exchangers and loss of material in service water components.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the Service Water Integrity Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M20.

The staff determined that this program implements the recommendations from GL 89-13 to manage aging effects in the SWSs. Components within the scope of this program are inspected for erosion, corrosion, and blockage. Performance testing of heat exchangers within the scope of this program is carried out to verify acceptable performance. In addition, chemical treatment with biocides and chlorine is performed, along with periodic cleaning and flushing of redundant or infrequently used loops, to control or prevent fouling within the heat exchangers and loss of material in service water components. The staff finds that these activities are consistent with the recommendations in GALL AMP XI.M20, and are acceptable.

The staff reviewed the applicant's Raw Water Systems Program Plan which identifies the various program activities conducted on the applicant's raw water and SWSs associated with the implementation of the applicant's GL 89-13 commitments to the staff. The ongoing programmatic activities implementing the applicant's GL 89-13 commitments include: biofouling controls such as, monitoring and inspections, chlorine injection, chemical treatments to control Microbiologically Influenced Corrosion (MIC), a Zebra Mussel Control Program, and molluscide treatments; a heat exchanger testing program; and an inspection and maintenance program. The staff finds that the applicant's GL 89-13 implementation program and activities are in

accordance with GL 89-13 and are consistent with GALL AMP XI.M20.

The staff finds the applicant's Service Water Integrity Program acceptable because it is consistent with the recommended GALL AMP XI.M20, "Open-Cycle Cooling Water System," with an exception as described:

Exception. The LRA states an exception to the GALL Report program element "preventive actions." Specifically, the exception state:

> NUREG-1801 states that system components are lined or coated. Components are lined or coated only where necessary to protect the underlying metal surfaces.

During the audit and review, the staff asked the applicant to provide additional information regarding the components that are lined or coated, and how aging of these linings is managed.

In response, the applicant stated that there are no linings or coatings used within the service water piping. However, as described in the design basis document for SWSs, the use of appropriate materials is controlled by design processes which consider the environment and operating experience to ensure appropriate materials are selected. It also includes an example of service water components that were modified to include protective coatings. These coatings are not credited to prevent or minimize aging effects on components and, as such, the AMP does not identify components that are lined or coated, nor are specific linings or coating inspections needed.

The applicant further stated that the service water integrity AMP includes visual inspections and non-destructive testing methods, including ultrasonic testing and eddy current testing of heat exchanger tubes. Unlined/uncoated components in the SWS are inspected as part of this program to ensure that aging effects do not affect their ability to perform their intended functions. The use of appropriate materials is controlled by design processes which consider the environment and operating experience to ensure appropriate materials are selected.

The staff determined that the applicant's Service Water Integrity Program, in accordance with GL 89-13, includes a condition and performance monitoring program which inspects components for erosion, corrosion, and blockage and verifies the heat transfer capability of the safety-related heat exchangers cooled by service water. Chemical treatment using biocides and chlorine and periodic cleaning and flushing of redundant or infrequently used loops are used to control or prevent fouling within the heat exchangers and loss of material in service water components. The staff finds that the applicant is taking measures with inspections and chemical treatments under the Service Water Integrity Program to compensate for the SWS components which in general, do not have internal protective linings or coatings. On this basis, the staff finds this exception acceptable.

Operating Experience. LRA Section B.1.26 states that during 2000 and early 2001, ESW-cooled heat exchangers did not meet target flow rates due to accumulation of silt and ferrous oxide. Thermal performance testing verified the ability of the coolers to perform as required under accident conditions. When testing detected degraded thermal performance by several coolers, an action plan was developed. Corrective actions were implemented to

chemically clean the ESW supply lines; clean the crescent area unit coolers; and vent, drain, and flush ESW unit coolers and piping. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing fouling of SWS components. The results in 2005 from tests of the RHR and ESW cooled heat exchangers showed them capable of removing the required amount of heat, proving that the program is effective for managing fouling of SWS components. Eddy current testing of EDG jacket water coolers in 2004 (EDG-D) and 2005 (EDG-A, B, and C) detected pitting in some of the tubes but not degradation sufficient to require tube plugging. None of the inspected tubes was blocked by debris or deposits and the tubes appeared to be very clean. The tubesheets were in good condition and there was no evidence of degradation of the tube to tubesheet joints. Absence of degradation proves that the program is effective for managing loss of material for SWS components.

Results of SWS visual and other nondestructive examinations (2000 to 2004) detected areas of erosion and corrosion on internal and external surfaces. Corrective actions included replacement of RHRSW pumps, replacement of ESW and normal service water piping components, replacement of EDG jacket water heat exchangers, and close monitoring of RHRSW and ESW pump discharge strainer housings by ultrasonic inspections with repair as needed. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing loss of material for SWS components. A two-week ESW system assessment in February 2000 detected weaknesses in the Service Water Integrity Program. Corrective actions were taken to re-constitute the licensing commitments of GL 89-13, update plant procedures to reflect GL 89-13 commitments, and update the program manual. Significant improvements addressing lack of program ownership, weak program maintenance and monitoring, and deficient knowledge and skills were also made. Detection of program weakness and corrective action prove that the program will remain effective for managing loss of material for SWS components. During the fall of 2005, NRC conducted an integrated inspection which included an assessment of maintenance effectiveness for the ESW system. Results confirmed that plant personnel had maintained the ESW system, assuring its capability of performing its intended function. Deficiencies are detected and appropriate corrective actions implemented.

During the audit and review, the staff asked the applicant for additional information related to the erosion and corrosion identified during the 2000-2004 period, which resulted in component replacements.

In response, the applicant stated that the results of SWS visual and other non-destructive examinations revealed erosion and areas of corrosion on internal and external surfaces. Corrective actions included replacement of all four original RHRSW pumps, replacement of all four EDG jacket water heat exhangers, and close monitoring of RHRSW and ESW pump discharge strainer housings by ultrasonic inspections with repair, as necessary. Sections of the ESW and normal service water (NSW) piping are scheduled for followup non-destructive examinations to allow for sufficient replacement as required, prior to reaching degradation limits. A number of ESW unit cooler/heat exchanger coils have been replaced and the additional unit cooler/heat exchanger coils are scheduled for replacement as part of the JAFNPP long term plan EN-PL-170.

The applicant also stated that approximately 1 percent of the ESW and NSW piping has been replaced due to visual and non-destructive examinations. The piping was replaced with carbon steel for the most part. Carbon steel piping has aged well at JAFNPP as evidenced by the more than 30 years of service prior to the implementation of the extensive visual and non-destructive examination controls now in place. Continuous chlorination is now performed for both the ESW and NSW systems. The use of BULAB chemicals assists the chlorine in penetrating any buildup within the piping and keeps dissolved substances and silt in suspension so as to exit the system piping. The frequency of preventive maintenance (PM) activities is selected to minimize pipe wall thinning and maximize design functionality. Periodic flow surveillance testing and flushing of stagnant system legs are performed to control system degradation. Stainless steel has been used in areas subject to erosion to extend the service life of piping exposed to cavitation.

The applicant stated that UT inspections of the RHRSW pump discharge and RHRSW system strainers have been ongoing since 2001. Several below-minimum wall thickness areas of the strainers have been repaired. No repairs have been necessary for the RHRSW pumps. The ESW duplex strainers have experienced only a single repair due to wall thinning on the strainer basket housings.

The staff determined that this operating experience demonstrates that the applicant's service water integrity program is able to detect degradation of components prior to a loss of intended function. Also, appropriate corrective actions are taken to prevent a recurrence of the degradation or future component failures.

The staff interviewed applicant personnel and also reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience. The JAFNPP operating experience included detection of erosion, corrosion, and blockage in system components via inspections and performance testing of SWS components. These aging effects are consistent with industry operating experience, and this AMP includes aging management activities, such as chemical treatment, performance testing, visual inspections, non-destructive examination (NDE), and flushing activities, that are appropriate to detect and manage this aging degradation. Corrective actions were taken in accordance with the plant corrective action program prior to a loss of intended function of the component. As an example of the applicant's implementation of the service water integrity program and associated corrective actions, the staff reviewed a work order package for the EDG 'D' jacket water cooler cleaning, visual inspection, and eddy current inspection. The work order documented performance of the PM activity during which a small packing flange leak was detected and repaired prior to returning the jacket water cooler to service. The staff finds that this is a verification that the corrective action process is being implemented adequately.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Service Water Integrity Program will adequately manage the aging effects identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1, item A.2.1.28, the applicant provided the UFSAR supplement for the Service Water Integrity Program. The staff determines that the information in the UFSAR supplement provides 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 Service Water Integrity Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.18 Structures Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.27.2 describes the existing Structures Monitoring Program as consistent, with enhancements, with GALL AMP XI.S6, "Structures Monitoring Program."

Structures monitoring in accordance with 10 CFR 50.65 is addressed in Regulatory Guide 1.160 and NUMARC 93-01. These two documents guide development of licensee-specific programs to monitor the condition of structures and structural components within the scope of 10 CFR 50.65 so there is no loss of structure or structural component intended function. The program does not address protective coating monitoring and maintenance because protective coatings are not relied upon to manage the aging effects for structures included in the Structures Monitoring Program.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the Structures Monitoring Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.S6.

The staff finds the applicant's Structures Monitoring Program acceptable because it conforms to the recommended GALL AMP XI.S6, "Structures Monitoring Program," with enhancements as described below.

Enhancement 1. The LRA states an enhancement to meet the following GALL Report program element:

Element: 1: scope of program

Enhancement: The Structures Monitoring Program procedure will be

enhanced to specify that the manholes, duct banks, underground fuel oil tank foundations, manway seals and gaskets, hatch seals and gaskets, underwater concrete in the intake structure, and crane rails and girders are included in the program.

The staff reviewed the applicant's response and determined that the structures, structural components, and their Aging Effect Requiring Managements (AERMs) under the scope of the Structures Monitoring Program are included in LRA Tables 3.5.2-1 through 3.5.2-6. Visual inspections of most plant structures are performed at five-year intervals. The intake and discharge tunnel structures areas are performed at 10-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 found this information acceptable, since the corrective action program will address expansion of scope when significant degradation is observed.

The staff finds this enhancement acceptable because when enhancements are implemented, the Structures Monitoring – Structures Monitoring Program will be consistent with GALL AMP XI.S6 and will provide additional assurance that the effects of aging will be adequately managed (Commitment No. 16 (JAFP-06-0109, dated July 31, 2007)).

Enhancement 2. The LRA states an enhancement to meet the following GALL Report program element:

Element: 4: detection of aging effects

Enhancement: A- Guidance for performing structural examinations of elastomers and rubber components (seals, gaskets, seismic joint filler, drywell floor line seal and roof elastomers) to identify cracking and change in material properties will be added to the Structures Monitoring Program procedure.

B- Guidance for performing periodic inspections to confirm the absence of aging effects for Lubrite surfaces in the torus radial beam seats will be added to the Structures Monitoring Program procedure.

The GALL Report identified the following recommendation for the "detection of aging effects" program element associated with the enhancement:

For each structure/aging effect combination, the inspection methods, inspection schedule, and inspector qualifications are selected to ensure that aging degradation will be detected and quantified before there is loss of intended functions. Inspection methods, inspection schedule, and inspector qualifications are to be commensurate with industry codes, standards and guidelines, and are to also consider industry and plant-specific operating experience. Although not required, American Concrete Institute (ACI) 349.3R-96 and ANSI/ASCE 11-90 provide an

acceptable basis for addressing detection of aging effects. The plant structure monitoring program is to contain sufficient detail on detection to conclude that this program attribute is satisfied.

The applicant stated in the LRA for JAFNPP that cracks, gaps, and corrosion will be monitored as stated in the program basis document. For concrete, the Structures Monitoring Program manages loss of material, cracking, and change in material properties, as identified in LRA Tables 3.5.2-1 through 3.5.2-6. The acceptance criteria are the absence of the following: cracks, excessive rust bleeding, staining or discoloration, abrasion, erosion, cavitation, spalling, scaling, leaching, excessive settlement, corrosion of reinforcing, and degraded waterproof membranes. For steel, the Structures Monitoring Program manages the loss of material, as identified in LRA Tables 3.5.2-1 through 3.5.2-6. The acceptance criteria are the absence of the following: pitting, beam/column deflection, cracks, flaking coatings, excessive rust, loose/missing bolts, peeling paint, and wide spread corrosion. For elastomers, the aging effects managed are cracking and change in material properties. The acceptance criteria include the absence of cracks and gaps.

During the audit and review, the staff asked the applicant whether it intends to inspect inaccessible areas that may be exposed by excavation for any reason, whether the environment is aggressive or not, and also whether it intends to inspect inaccessible areas if degradation is observed in accessible areas which are exposed to the same environment. In its response, the applicant stated that JAFNPP site procedure will be enhanced to require opportunistic inspections of inaccessible concrete areas when they become accessible. This enhancement is identified as Commitment No. 16 in a letter dated February 1, 2007.

The staff also asked the applicant, during the audit and review, about the aging management of inaccessible concrete areas and the groundwater for aggressive or non-aggressive. In its response, the applicant stated that JAFNPP has determined that ground water is not aggressive and will enhance to the structures Monitoring Program to perform an engineering evaluation on a periodic basis at least once every five years of ground water samples to assess aggressiveness (pH < 5.5, Chloride > 500 ppm and Sulfate > 1500 ppm).This enhancement is also identified as Commitment No. 16 in its letter dated February 1, 2007. The staff finds this acceptable since opportunistic inspections will be performed to monitor the aggressiveness of the concrete.

The applicant also stated that expanding inspection to other areas where significant concrete degradation is observed in the accessible areas will continue to be part of its corrective action program as identified in LRA Appendix B.0.3. The staff found this response to be acceptable since the corrective action program will address expansion of scope when significant degradation is observed.

The staff finds these enhancements acceptable because when enhancements are implemented, the Structures Monitoring – Structures Monitoring Program will be consistent with GALL AMP XI.S6 and provide additional assurance that the effects of aging will be adequately managed (Commitment No. 16).

<u>Operating Experience</u>. LRA Section B.1.27.2 states that inspections from 2000 through 2004 of structural steel, concrete exposed to fluid, and structural elastomers revealed such degradation

as cracks, gaps, corrosion (rust), and flaking coatings. In 2002, due to documentation deficiencies, inspections were not at specified frequencies. Structural monitoring inspections were added to the PM work management system to meet future due dates. Structural monitoring of concrete SCs during 2005 detected minor cracks that did not affect component structural integrity. Monitoring of structural steel members detected minor corrosion only. Inspection intervals were adjusted as necessary for future inspections to detect degradation prior to loss of intended function. Detection of degradation and corrective action prior to loss of intended function prove that the program is effective for managing aging effects for structural components. A QA surveillance in August 2003 revealed no issues or findings with impact on program effectiveness.

The staff interviewed the applicant's personnel and reviewed operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for components within the scope of this program that are not bounded by industry operating experience. A review of the condition reports showed that potential degraded conditions are identified and corrected through the applicant's corrective action process.

During the audit and review, the staff pointed out to the applicant that some BWR units have a history of problems with containment penetration bellows and asked whether they have evaluated this operating experience. In its response, the applicant stated that there are no JAFNPP plant operating experiences similar to that identified at those facilities. The normal environment for the JAFNPP drywell is dry and there has been no indication of contamination of the bellows during construction at JAFNPP. In addition, containment bellows for JAFNPP are not exposed to a corrosive environment. As such, stress corrosion cracking (SCC) is not applicable to JAFNPP stainless steel bellows. The staff reviewed the applicant's response and its evaluations and finds the applicant's response acceptable, since the environment conducive to SCC does not exist at JAFNPP.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s Structures Monitoring 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. The staff finds this program element acceptable.

<u>UFSAR Supplement</u>. In LRA Section A.2.1.30, the applicant provided the UFSAR supplement for the Structures Monitoring Program. The staff reviewed the applicant’s license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the program enhancements are identified as Commitment No. 16, to be implemented before the period of extended operation.

The staff determines that the information in the UFSAR supplement provides 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 Structures Monitoring Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirmed

that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.19 Water Chemistry Control - Closed Cooling Water Program

Summary of Technical Information in the Application. LRA Section B.1.29.3 describes the existing Water Chemistry Control - Closed Cooling Water Program as consistent, with exception, with GALL AMP XI.M21, “Closed-Cycle Cooling Water System.”

This program’s preventive measures manage loss of material, cracking, and fouling for components in closed cooling water systems (jacket cooling water subsystem for the emergency diesel generator, RBCLC, and turbine building closed loop cooling (TBCLC)). These activities monitor and control closed cooling water chemistry by plant-specific procedures and processes based on EPRI guidance for closed cooling water chemistry.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the Water Chemistry Control-Closed Cooling Water Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M21.

In its response to the staff’s inquiry, during the audit and review, regarding the EPRI guidance document cited in LRA Section B.1.29.3 and the basis document as the basis for the activities for monitoring and controlling closed cooling water chemistry, the applicant stated that the program is based on EPRI TR-1007820, “Closed Cooling Water Chemistry Guideline, Revision 1 to TR-107396,” published in April 2004. ALL AMP XI.M21, “Closed Cycle Cooling Water System,” cites EPRI TR-107396, “Closed Cooling Water Chemistry Guideline, “ published in October 1997, as the technical basis for the program. Revision 1 of the EPRI guideline document includes more detail on the various water treatment methods used at nuclear power plants and provides more detailed information on control and diagnostic parameters, monitoring frequencies, operating ranges, and action levels. At the staff’s request, the applicant provided documentation of its review and evaluation of EPRI TR-1007820 in comparison to the original EPRI guideline and the recommended actions to incorporate the Revision 1 guidelines into the JAFNPP program and procedures.

The staff reviewed the applicant’s evaluation and confirmed that the applicant had incorporated EPRI TR-1007820 as the technical basis guideline for the Water Chemistry Control - Closed Cooling Water Program. The staff determined that the use of EPRI TR-1007820 provides guidance consistent with the recommendations in GALL AMP XI.M21 and offers more detail on the various water treatment methods used at nuclear power plants, as well as control and

diagnostic parameters, monitoring frequencies, operating ranges, and action levels. Therefore, the staff finds the use of EPRI TR-1007820 as the basis for this program acceptable.

The staff finds the applicant's Water Chemistry Control - Closed Cooling Water Program acceptable because it is consistent with the recommended GALL AMP XI.M21, "Closed-Cycle Cooling Water System," with an exception as described:

Exception. The LRA Section B.1.21 states an exception to the GALL Report program elements "parameters monitored or inspected," and "detection of aging effects."
Specifically, the exception states:

> The JAFNPP Water Chemistry Control - Closed Cooling Water Program does not include performance and functional testing.

The LRA Section B.1.29.3 discussion of this exception includes a footnote that states the following:

> While NUREG-1801, Section XI.M21, Closed-Cycle Cooling Water System endorses EPRI report TR-107396 for performance and functional testing guidance, EPRI report TR-107396 does not recommend that equipment performance and functional testing be part of a water chemistry control program. This appears appropriate since monitoring pump performance parameters is of little value in managing effects of aging on long-lived, passive CCW system components. Rather, EPRI report TR-107396 states in section 5.7 (Section 8.4 in EPRI report 1007820) that performance monitoring is typically part of an engineering program, which would not be part of water chemistry. In most cases, functional and performance testing verifies that component active functions can be accomplished and as such would be included as part of Maintenance Rule (10 CFR 50.65). Passive intended functions of pumps, heat exchangers and other components will be adequately managed by the Closed Cooling Water Chemistry and One-Time Inspection programs through monitoring and control of water chemistry parameters and verification of the absence of aging effects.

During the audit and review, the staff asked the applicant for additional information to justify not performing testing and functional inspections as part of this AMP.

In response, the applicant stated that in most cases, functional and performance testing verifies that component active functions can be accomplished and, as such, are governed by the Maintenance Rule (10 CFR 50.65). For example, loss of material cannot be detected by system performance testing. Passive intended functions of pumps, heat exchangers, and other components will be adequately managed by the Closed Cooling Water Chemistry and One-Time Inspection programs through monitoring and control of water chemistry parameters and verification of the absence of aging effects.

In addition, the applicant stated that corrosion coupons are used to monitor the effects of corrosion on the reactor building closed loop cooling water and the turbine closed loop cooling water systems. The applicant also stated that LRA Section B.1.21, "One-Time Inspection," describes inspections planned to verify the effectiveness of the water chemistry control

programs to ensure that significant degradation is not occurring and component intended function is maintained during the period of extended operation.

The staff reviewed EPRI Report TR-1007820 (Revision 1 to EPRI TR-107396) and determined that it does not recommend that performance and functional testing be part of the water chemistry control program. This engineering testing could be performed as part of another program. Usually, the Maintenance Rule (10 CFR 50.65) dictates the requirements of the performance and functional testing. The staff also noted that corrosion coupons are used to monitor the effects of corrosion on the reactor building closed loop cooling water and the turbine closed loop cooling water systems. This will provide an effective means of detecting corrosion and will provide additional assurance that aging effects are being managed. Finally, the staff noted that a one-time inspection will be performed to verify the effectiveness of this program for managing aging in the closed loop cooling water systems within the scope of this program. The staff finds that the activities included in this program are adequate to manage the aging effects for which the program is credited without the need for performance and functional testing. On this basis, the staff finds this exception acceptable.

Operating Experience. The program basis document states that from 2000 through 2004 there were several CRs of adverse trends in parameters monitored by the Water Chemistry Control - Closed Cooling Water Program. Corrective actions were taken within the Corrective Action Program to preclude violations of acceptance criteria. From 2000 through 2004, there were a few incidents of parameters monitored by the Water Chemistry Control - Closed Cooling Water Program outside of acceptance criteria. Monitoring frequency was increased and the parameters returned to within the prescribed normal operating range as soon as possible. The dissolved oxygen in the RBCLC system was a-long term plant concern. Loss of material occurred in the RBCLC piping due to low levels of dissolved oxygen in the water. In August 2003, an oxygen injection system was added to control dissolved oxygen between 30-200 ppb. A corrosion study in 2004 showed that this control of dissolved oxygen had lowered the general corrosion rate for carbon steel in RBCLC water.

The TBCLC system has had high dissolved oxygen concentration, which can cause pitting corrosion in carbon steel. An oxygen removal skid was installed and leaks were repaired to lower the dissolved oxygen concentration. Periodic feed and bleed operations to reduce tritium in the TBCLC system increase the concentration, requiring use of the oxygen removal skid. A corrosion study in 2004 revealed slightly higher general corrosion rates for TBCLC carbon steel than seen in the past. Corrective actions have been implemented to control TBCLC dissolved oxygen between 30 and 200 ppb. The Cycle 16 average chemistry data for the RBCLC and TBCLC systems compare favorably with the action Level 1 parameter values from the BWR Water Chemistry Guidelines. The dissolved oxygen in the RBCLC and TBCLC systems was better controlled this cycle with the oxygen removal skid for the TBCLC and a new oxygen addition system for the RBCLC system. Continuous confirmation of water quality and timely corrective action prove that the program is effective in managing component loss of material. A QA surveillance in 2004 revealed no issues or findings with impact on program effectiveness.

The staff reviewed a corrosion study conducted by the applicant to determine TBCLC general corrosion rates by measurements and calculations based on the condition of corrosion coupons and by projecting the life of future system components. The results showed that the general corrosion rates in the TBCLC system are low, with the highest rate being exhibited by carbon

steel. Extent of wall thinning falls into the 'Evaluate' category of plant procedure ENN-DC-133. The corrosion rate of the carbon steel was found to be 'Fair' and all other materials 'Excellent' according to EPRI guidelines. The corrosion rate calculation shows that the AMP has adequately controlled corrosion or SCC.

The staff reviewed two condition reports from the applicant’s operating experience program response to increased dissolved oxygen in the TBCLC system. In one CR, dissolved oxygen was found to be increasing at a high rate and, in response, the system deoxygenation skid was put into service more frequently. In the other CR, TBCLC dissolved oxygen was found to be increasing beyond the 3000 ppb action level and the deoxygenation skid was put into service to return the dissolved oxygen level to within limits. The staff finds that these examples are indications that system problems are being detected by the program and appropriate corrective actions are being implemented.

The staff reviewed two examples of response to RBCLC water chemistry operating experience. In the first example, responding to increases in RBCLC chloride, sulfate, and nitrate, the applicant initiated an action plan to identify the source of raw water in-leakage and then added a side stream demineralizer to return the RBCLC water quality to within limits. In the second example, the RBCLC experienced abnormal chemistry problems for an extended period. A review was conducted by the applicant to determine whether the chemistry problems had a potential aggregate effect in accordance with Institute of Nuclear Power Operations (INPO) SOER 02-4, "Reactor Pressure Vessel Head Degradation at Davis-Besse Nuclear Power Station," requirements. The review determined that there was no aggregate effect and that each of the abnormal chemistry conditions was either corrected or was being addressed by corrective actions. The staff finds that these examples are indications that system problems are being detected by the program and appropriate corrective actions are being implemented.

The staff also reviewed the operating experience provided in the applicant’s operating experience reports and determined that there were no aging effects identified that are outside the bounds of industry operating experience. The aging effects identified at JAFNPP for auxiliary system components exposed to treated water are loss of material, corrosion, and cracking, which are all consistent with industry operating experience. The components within the scope of this program are constructed of carbon steel, stainless steel, gray cast iron, and copper alloy. Exposure of these materials to an environment of treated water could result in the aging effects of loss of material, corrosion, or cracking. These aging effects are directly related to water chemistry and the dissolved oxygen concentration in the water. The JAFNPP indicates that instances of low and high oxygen concentration have been experienced in the RBCLC system and TBCLC systems, respectively. These instances were detected by this program and appropriate corrective actions were taken to restore oxygen concentrations to acceptable levels prior to a loss of intended function of the component. An oxygen injection system was installed in the RBCLC system to increase oxygen concentrations. An oxygen removal skid was installed in the TBCLC systems and leaks were repaired to reduce the oxygen concentration in those systems. This operating experience provides objective evidence to demonstrate that this program is effective in detecting conditions that would make the components within the scope of this program susceptible to aging degradation, and that appropriate corrective actions are taken in a timely manner.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Water Chemistry Control - Closed Cooling Water 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. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.34, the applicant provided the UFSAR supplement for the Water Chemistry Control - Closed Cooling Water Program. The staff determines that the information in the UFSAR supplement provides 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 Control - Closed Cooling Water Program, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. In addition, the staff reviewed the exception and the associated justifications, and determined that the AMP, with the exception, is adequate to manage the aging effects for which it is credited. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.2.20 Bolting Integrity Program

Summary of Technical Information in the Application. LRA Section B.1.30 describes the new Bolting Integrity Program as consistent, with enhancements, with GALL AMP XI.M18, "Bolting Integrity."

The Bolting Integrity Program (BIP) relies on recommendations for a comprehensive bolting integrity program, as delineated in NUREG-1339, and industry recommendations, as delineated in EPRI NP-5769, with the exceptions noted in NUREG-1339 for safety-related bolting. The program relies on industry recommendations for comprehensive bolting maintenance as in EPRI TR-104213 for pressure-retaining bolting and structural bolting.

Staff Evaluation. During its audit and review, 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.

The staff interviewed the applicant's technical staff and reviewed the Bolting Integrity Program bases documents. Specifically, the staff reviewed the program elements and associated bases documents to determine consistency with GALL AMP XI.M18.

During the audit and review, the staff verified that the applicant's program attributes for the BIP were all consistent with the program attributes in the GALL AMP, except for the "preventive actions" program attribute. The staff also verified that the applicant's program includes all

ASME Code, Section XI inspection requirements for ASME Code Class 1, 2, and 3 bolted connections by invoking the inspections for these bolts that are implemented as part of the applicant's ISI Program.

The staff noted that the applicant entered the 4th Ten-Year ISI Interval for JAFNPP in January 2007. The applicant was required by 10 CFR 50.55a (g)(4)(I) to update the ASME Code, Section XI (Section XI code of record) to the 2001 Edition of Section XI, inclusive of the 2003 Addenda. The staff requested confirmation from the applicant that the Section XI code of record for the 4th Ten-Year ISI Interval is the 2001 Edition of Section XI, inclusive of the 2003 Addenda.

The applicant clarified in its response that the 2001 Edition of Section XI, inclusive of the 2003 Addenda will be the new Section XI code of record for those JAFNPP AMPs referencing or crediting Section XI requirements. The applicant also stated that LRA Section A.2.1.18 will be amended to delete the relevant information for the 3rd 10-Year ISI Interval and to incorporate the relevant information for the 4th 10-year ISI Interval for JAFNPP, including a statement that the 2001 Edition of Section XI, inclusive of the 2003 Addenda is the applicable edition of Section XI for the 4th 10-Year ISI Interval. The applicant amended the LRA (Amendment 5) in its letter dated February 1, 2007.

The 4th 10-Year ISI Interval for JAFNPP will be the 10-Year interval in effect if the LRA is approved by the staff. The applicant's amendment of the LRA is in compliance with the requirements of 10 CFR 50.55a because the applicant was required by paragraph (b) of the rule to update in Section XI edition of reference to 2001 Edition of Section XI (inclusive of the 2003 Addenda), one year prior to entering the 4th 10-Year ISI Interval for JAFNPP. Based on this assessment, the staff concludes that the changes to the LRA are acceptable because they are in compliance with the requirements of 10 CFR 50.55a and in conformance (i.e., consistent) with the "scope of program" element in GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

The staff noted that the BIP also includes inspections for Non-Code Class mechanical and structural bolted connections. The staff verified that the inspections credited in this AMP for these components are consistent with the inspection criteria for Non-Code Class mechanical and structural bolted connections in GALL AMP XI.M18.

The staff finds the applicant's Bolting Integrity Program acceptable because it is consistent with the recommended GALL AMP XI.M18, "Bolting Integrity," with an enhancement as described:

Enhancements. The LRA states an enhancement to the GALL Report program element "preventive actions." Specifically, the enhancement states:

> The actual yield strength is used in selecting materials of low-susceptibility to stress corrosion cracking (SCC) and to preclude the use of lubricants containing MoS_2 for bolting at JAFNPP.

The applicant is using SA 193, Grade B7 steel bolts in the JAFNPP design, although the design does include some stainless steel bolts in stainless steel bolted connections. These SA 193, Grade B7 steel bolts are made from chromium-molybdenum alloy steel materials that are

quenched and tempered for additional hardness. Industry experience has demonstrated that SA 193 B7 bolting materials may be more susceptible to SCC when the yield strength of the procured materials is in excess of 150 ksi or if the hardness of the procured material is in excess of 32 on a Rockwell C Hardness scale. The staff has established its position that the actual yield strength of SA 193, Grad B7 bolts be limited to less than 150 ksi to mitigate the probability that SCC will occur in the bolting materials. The applicant has committed to monitor the actual yield strength property of procured SA 193, B7 bolting to ensure that the bolting used in the facility is in conformance with the staff's position on yield strength properties for the procured bolting materials.

The Journal Article "Effect of Molybdenum Disulfide on Electrochemical Corrosion of Metals," Journal of Chemistry and Technology of Fuels and Oils, Volume 5, Number 8 (August 1969), indicates that use of MoS_2 in lubricants or greases may increase the potential for corrosion to occur at friction points of mechanically secured metal components (such as bolted connections) and should be avoided. The applicant has committed to the practice of precluding the use of MoS_2-containing lubricants. This is in conformance with the recommendations of this journal article and is acceptable.

The staff finds this enhancement acceptable because when implemented the Bolting Integrity Program "preventive actions" program attribute will be consistent with GALL AMP XI.M18 and will add assurance of adequate management of aging effects (Commitment No. 19 (JAFP-06-0109, dated July 31, 2007)).

Operating Experience. LRA Section B.1.30 states that industry operating experience forming the basis for the Bolting Integrity program is described in the operating experience element of the GALL Report program description. Plant-specific operating experience is consistent with the operating experience in the GALL Report program description and provides reasonable assurance that the Bolting Integrity Program will manage aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extended operation.

The staff noted that applicant's reviews of operating experience and condition reports did not identify cracking or loss of preload as aging effects requiring management for pressure boundary bolting. The plant procedures implement the recommendations of NUREG-1339, "Resolution to Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants," for pressure boundary bolting within the scope of license renewal. Plant procedures address material and lubricant selection, design standards, and good bolting maintenance practices in accordance with EPRI 5067, "Good Bolting Practices."

The staff also interviewed the applicant's technical staff and reviewed operating experience reports including applicable condition reports and confirmed that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Bolting Integrity Program will adequately manage the aging effects identified in the LRA for which this AMP is credited.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in the GALL Report and in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.35, the applicant provided the UFSAR supplement summary description for the BIP. The staff reviewed LRA Section A.2.1.35 and compared it to the corresponding UFSAR supplement description for BIPs in SRP-LR Table 3.1-2. The staff determined that the UFSAR supplement summary description for the applicant’s BIP is consistent with the corresponding summary description in SRP-LR Table 3.1-2. The staff reviewed the applicant’s license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the program enhancement is identified as Commitment No. 19, to be implemented before the period of extended operation.

Based on this assessment, the staff concludes that LRA Section A.2.1.35 provides an adequate UFSAR supplement summary description of the BIP, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its audit and review of the applicant’s BIP, the staff finds those program elements, for which the applicant claimed consistency with the GALL Report are consistent. Also, the staff reviewed the enhancements and confirmed that the implementation of the enhancements prior to the period of extended operation would result in the existing AMP being consistent with the GALL AMP to which it was compared. The staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3 AMPs That Are Not Consistent with or Not Addressed in the GALL Report

In LRA Appendix B, the applicant identified that the following AMPs are plant-specific:

- Heat Exchanger Monitoring Program
- Containment Inservice Inspection Program
- Inservice Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Water Chemistry Control - Auxiliary Systems Program
- Bolted Connections Program

For AMPs not consistent with, or not addressed in the GALL Report, the staff performed a complete review to determine whether these AMPs are adequate to monitor or manage aging. The staff’s review of these plant-specific AMPs is documented in the following sections of this SER.

3.0.3.3.1 Heat Exchanger Monitoring Program

Summary of Technical Information in the Application. LRA Section B.1.15 describes the new plant-specific Heat Exchanger Monitoring Program.

The Heat Exchanger Monitoring Program will inspect heat exchangers for degradation and, if found, evaluate its effects on the heat exchanger's design functions including its ability to withstand a seismic event. Representative tubes of heat exchangers will be eddy current-tested at a frequency determined by internal and external operating experience to detect aging effects prior to loss of intended function. Along with each eddy current test, there will be visual inspections on accessible heat exchanger heads, covers, and tube sheets to monitor surface conditions for loss of material. The heat exchangers include the HPCI turbine lube oil coolers, gland seal condensers, and EDG lube oil heat exchangers. The program will be implemented fully prior to the period of extended operation. This is Commitment No. 7 (JAFP-06-0109, dated July 31, 2007) in the applicant's letter dated December 6, 2006.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in LRA Section B.1.15 regarding the applicant's demonstration of the Heat Exchanger Monitoring Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff interviewed the applicant's technical staff and reviewed program basis document which provides an assessment for each of the AMP elements.

During the audit and review, the staff reviewed the Heat Exchanger Monitoring Program against the AMP elements found in the GALL Report, SRP-LR Section A.1.2.3, and SRP-LR Table A.1-1, focusing its review on how the program manages aging effects through the effective incorporation of 10 elements (i.e., "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," "administrative controls," and "operating experience").

The applicant indicated that the "corrective actions," "confirmation process," and "administrative controls" program elements are part of the site-controlled QA program. The staff's evaluation of the QA program is discussed in SER Section 3.0.4. The remaining seven elements are discussed below.

(1) Scope of Program - In LRA Section B.1.15 the applicant stated that the Heat Exchanger Monitoring Program will manage aging effects on selected heat exchangers in various systems as identified in aging management reviews (AMRs).

The staff reviewed the applicant's program basis document for this AMP, and determined that the scope of this AMP includes the HPCI turbine lube oil coolers and gland seal condensers, and the EDG lube oil heat exchangers. The staff determined that these components are not covered by other AMPs; therefore, they are appropriately included within the scope of this program. The staff finds the "scope of program" acceptable since it specifically identifies the components within the scope of this program.

The staff confirmed that the specific components for which the program manages aging effects are identified by the applicant, which satisfies the criterion as defined in SRP-LR Appendix A.1.2.3.1. The staff finds this program element acceptable.

(2) Preventive Actions - In LRA Section B.1.15, the applicant stated that this is an inspection program and no actions are taken as part of this program to prevent degradation.

The staff reviewed the applicant's program basis document for this AMP, and determined that this is a condition monitoring program; therefore, it does not rely on preventive actions.

This is an inspection program and no actions are taken as part of this program to prevent degradation. SRP Item 2, "preventive action," is not applicable because the Heat Exchanger Monitoring Program is an inspection program. The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff concludes that this program element is acceptable.

(3) Parameters Monitored or Inspected - In LRA Section B.1.15, the applicant stated that where practical, eddy current inspections of shell-and-tube heat exchanger tubes will be performed to determine tube wall thickness. Visual inspections will be performed on heat exchanger heads, covers and tube sheets where accessible to monitor surface condition for indications of loss of material.

The staff determined that the parameter to be monitored is tube wall thickness, using eddy current inspection. When this is not practical, indications of loss of material will be monitored using visual inspection.

During the audit and review, the staff asked the applicant for further information on when visual inspection will be used in lieu of eddy current testing.

In response, the applicant stated that eddy current testing will be performed when practical as determined by the tubes' physical location, physical size, orientation, physical dimensions, accessibility and disassembly of the heat exchangers. If eddy current inspection is determined to be impractical, aging of the heat exchanger tubes will be managed using visual inspection of the external portion of heat exchanger tubes, which is conducted during maintenance activities and is focused on detecting the extent of tube erosion, corrosion, fouling and scaling, and on the detection of corrosion at the tubesheet and rolled tube joints. In some cases, heat exchanger heads, partition plates, baffles, covers, or tubesheets are of the same material/environment combination as tubes, which provides additional data for determining inspection frequency and the presence of aging effects.

The staff determined that the applicant's use of wall thickness via eddy current testing, or indications of loss of material via visual inspection as the parameters to be monitored will provide an effective method of detecting degradation of heat exchanger tubes. The components within the scope of this program are the HPCI turbine lube oil coolers and gland seal condensers, and the EDG lube oil heat exchangers. These heat exchangers have tubes constructed of copper alloy that are exposed to lube oil or treated water on the external surface. The aging effect of concern for these components is loss of material due to wear. This aging effect can result in wall thinning of the heat exchanger tubes, which is what the applicant is crediting this program to manage. Eddy current

testing has been shown to be an effective method of monitoring for tube wall defects and degradation, and is a proven industry inspection practice. The results of the eddy current inspection will provide timely detection of degradation so that corrective actions can be taken prior to a loss of component intended function. Visual inspections of heat exchanger components with the same material/ environment combination as the tubes will also provide information that can be used to determine if degradation is occurring, and whether further action is needed to manage aging. The visual inspections will provide timely detection of degradation so that corrective actions can be taken prior to a loss of component intended function. On this basis, the staff finds the parameters monitored acceptable to manage aging for the heat exchangers within the scope of this program.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff concludes that this program element is acceptable.

(4) Detection of Aging Effects - In LRA Section B.1.15, the applicant stated that loss of material is the aging effect managed by this program. Representative tubes within the sample population of heat exchangers will be eddy current tested at a frequency determined by internal and external operating experience to ensure that effects of aging are identified prior to loss of intended function. Visual inspections of accessible heat exchangers will be performed on the same frequency as eddy current inspections.

In LRA Section B.1.15, the applicant further stated that an appropriate sample population of heat exchangers will be determined based on operating experience prior to inspections. Inspection can reveal loss of material that could result in degradation of the heat exchangers. Fouling is not addressed by this program.

During the audit and review, the staff asked the applicant to provide additional information on the rationale for establishing the sample population for eddy current inspection.

In response, the applicant stated that the sample population of heat exchangers will be determined based on the materials used in construction of the heat exchanger tubes and the associated environments, as well as the type of heat exchanger (for example, shell and tube type). At least one heat exchanger of each type, material, and environment combination will be included in the sample population. This ensures that potential impacts of different design, material and environment combinations will be addressed. Representative tubes within the heat exchanger sample population will be selected based on previous eddy current inspections, work order history, such as corrective maintenance, tube plugging history, engineering evaluation, EPRI guidance, and service conditions of the heat exchanger. The sample tubes are selected based upon the locations in the bundle most prone to discovering mechanistic failures, such as pitting, tube erosion, and lagging vibration wear/fret damage.

The staff determined that the applicant’s approach to determining a sample population for eddy current testing will be based on the materials of construction and the environment to which the heat exchanger tubes are exposed. In addition, the type of

heat exchanger (for example, shell and tube type) will be considered. The applicant will include at least one heat exchanger of each type, material, and environment combination in the sample population to ensure that the potential impacts of different design, material and environment combinations will be addressed. The staff determined that this approach will provide reasonable assurance that the effects of aging for which this program is credited will be effectively detected since each material/environment combination will be inspected. In addition, tubes located in areas that are most susceptible to degradation will be included in the sample population, which provides assurance that the leading indicators of degradation will be inspected. Therefore, the staff finds this approach for determining sample population acceptable.

During the audit and review, the staff asked the applicant to provide additional information on the inspection frequency to be used for eddy current testing and visual inspection.

In response, the applicant stated that baseline eddy current testing will be performed to document the as-found condition of the components. The results of these baseline inspections will then be used to determine the frequency of future inspections and the sample size to be inspected. A similar approach will be used for visual inspections, in which baseline results will be used to determine the frequency of future inspections.

The staff determined that the applicant's approach of using baseline results to document the as-found condition of the components, and then determining future test or inspection frequencies based upon the baseline results is reasonable. The baseline results will reflect plant-specific operating experience with these components, and will provide objective evidence of the condition of the components that can be used to develop future test or inspection frequencies. Depending upon the extent of the degradation detected during the baseline test or inspection, appropriate frequencies for future testing or inspections can be determined. If there is significant degradation detected by the baseline results, a more frequent test or inspection frequency would be warranted, and can be implemented. Therefore, the staff finds the applicant's approach for determining test and inspection frequency acceptable.

The staff determined that the applicant's use of eddy current testing and visual inspections will provide an effective method of detecting degradation of heat exchanger tubes. The components within the scope of this program are the HPCI turbine lube oil coolers and gland seal condensers, and the EDG lube oil heat exchangers. These heat exchangers have tubes constructed of copper alloy that are exposed to lube oil or treated water on the external surface. The aging effect of concern for these components is loss of material due to wear. This aging effect can result in wall thinning of the heat exchanger tubes, which is what the applicant is crediting this program to manage. Eddy current testing has been shown to be an effective method of monitoring for tube wall defects and degradation, and is a proven industry inspection practice. The results of the eddy current inspection will provide timely detection of degradation so that corrective actions can be taken prior to a loss of component intended function. Visual inspections of heat exchanger components during maintenance, or for components with the same material/environment combination as the tubes will also provide information that can be used to determine if degradation is occurring and whether further action is needed to

manage aging. The visual inspections will provide timely detection of degradation so that corrective actions can be taken prior to a loss of component intended function. On this basis, the staff finds the activities for the detection of aging effects acceptable to manage aging for the heat exchangers within the scope of this program.

The staff confirmed that the "detection of aging effects" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff concludes that this program element is acceptable.

(5) Monitoring and Trending - In LRA Section B.1.15, the applicant stated that results will be evaluated against established acceptance criteria and an assessment will be made regarding the applicable degradation mechanism, degradation rate and allowable degradation level. This information will be used to develop future inspection scope and to modify inspection frequency, if appropriate. Wall thickness will be trended and projected to the next inspection. Corrective actions will be taken if projections indicate that the acceptance criteria may not be met at the next inspection.

The staff reviewed the applicant's program basis document for this AMP and verified that monitoring and trending activities will include comparison of wall thickness test results against established acceptance criteria. These results will be evaluated to determine if corrective actions are required or if modifications are needed to the inspection frequency. The wall thickness results will also be trended against prior wall thickness results and projected to the next inspection. This will provide predictability of the extent of degradation, as well as a forward projection of the degradation. This projection can be used to ensure that timely corrective actions can be taken, should the rate of degradation be found unacceptable, prior to the loss of component intended function. The staff determined that these activities are adequate to meet the monitoring and trending program element for this AMP. On this basis, the staff finds this program element acceptable.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff concludes that this program element is acceptable.

(6) Acceptance Criteria - In LRA Section B.1.15, the applicant stated that the minimum acceptable tube wall thickness for each heat exchanger to be eddy current inspected will be established based upon a component-specific engineering evaluation. Wall thickness will be acceptable if greater than the minimum wall thickness for the component.

In LRA Section B.1.15, the applicant further stated that the acceptance criterion for visual inspections of heat exchanger heads, covers and tubesheets will be the absence of evidence of degradation that could lead to loss of function. If degradation that could lead to loss of intended function is detected, a condition report will be written and the issue resolved in accordance with the site corrective action program.

The staff determined that the acceptance criteria for ultrasonic inspections will be established through a component-specific engineering evaluation. Each component will be evaluated in terms of its design function and operating conditions to determine the

minimum acceptable tube wall thickness that will allow that component to meet its intended function. The acceptance criteria will ensure that the heat exchanger tubes have sufficient wall thickness to perform their intended function, consistent with the current licensing basis during the period of extended operation. Eddy current testing will be performed periodically to measure the tube wall thickness and compare it to the acceptance criterion established by the engineering evaluation. If the tube wall thickness is found to be below the minimum acceptable wall thickness, or if projections show that the wall thickness will reach the minimum acceptable value prior to the next inspection, corrective actions will be taken in accordance with the plant corrective action program. In addition, the visual examination acceptance criteria will ensure that degradation that could lead to a loss of intended function is not occurring. If degradation is detected, corrective actions in accordance with the requirements of Appendix B will be taken in accordance with the plant corrective action program. On this basis, the staff finds this program element acceptable.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff concludes that this program element is acceptable.

(10) Operating Experience - LRA Section B.1.15 states that the Heat Exchanger Monitoring Program is a new program. The elements which comprise this program (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice. Operating experience provides reasonable assurance that implementation of the Heat Exchanger Monitoring Program will manage aging effects so that components will continue to perform their intended functions consistently with the CLB for the period of extend operation.

During the audit and review, the staff asked the applicant for additional information on the JAFNPP plant-specific operating experience related to the components for which this AMP is credited to manage aging.

In response, the applicant stated that the Heat Exchanger Monitoring Program manages loss of material for copper alloy heat exchanger tubes in the lube oil and gland seal condenser subsystems of the HPCI pump turbine and EDG engine lube oil cooler. Of these components only the HPCI turbine lube oil cooler has been inspected. These inspections occurred in 1998 and 2006 and detected no evidence of degradation. A review of site condition reports and records did not document any failures on these heat exchangers.

The staff determined that the lack of degradation for the HPCI pump turbine lube oil cooler provides an acceptable indication that no aging effects outside the scope of industry operating experience are occurring. Since the EDG lube oil coolers have the same material/environment combination as the HPCI pump turbine lube oil cooler, and similar operating conditions, the EDG lube oil cooler is expected to have a similar lack of degradation. Therefore, the staff finds that the plant-specific operating experience confirms that the components within the scope of this program are not experiencing aging effects not bounded by industry operating experience.

The staff also reviewed the condition report documenting the eddy current testing of heat exchanger 93WE-1B in which tube wall thinning was found. The wall loss exceeded the general acceptance criteria of 20% per plant procedure AP-19.14; therefore, an evaluation was performed to compare the as-found wall thickness with the minimum allowable wall thickness, as determined by calculation JAF-CALC-EDG-02946. The evaluation found the tube to have a remaining service life of 2.2 years. Based on this evaluation, corrective actions were implemented to increase the PM frequency for cleaning and eddy current testing of the heat exchanger, and to obtain a second data point. A work order was also issued to replace the heat exchanger as a contingency. The staff determined that, while this heat exchanger is not within the scope of this program, this event demonstrates that heat exchanger eddy current inspections are performed at JAFNPP and are effective at detecting degradation in a timely manner, prior to a loss of component intended function. In addition, the corrective actions taken are appropriate to ensure that the cause of the degradation is properly managed.

The staff interviewed the applicant's personnel and also reviewed plant operating experience reports and noted that none of the condition reports identified as aging-related involved the HPCI pump turbine or EDG engine oil coolers. The staff finds this an acceptable indication that these heat exchanger components at JAFNPP are not experiencing any aging effects not bounded by industry operating experience.

The staff recognizes that heat exchangers with tubes constructed of copper alloy and exposed to lubricating oil or treated water can experience a loss of material due to wear. While the plant-specific operating experience at JAFNPP does not include evidence that this is occurring for the heat exchangers within the scope of this program, this aging effect is consistent with industry operating experience and should be managed. This aging effect can result in thinning of the tube walls, which, if not corrected, could result in a loss of component intended function. The applicant’s heat exchanger monitoring program includes periodic eddy current testing of heat exchanger tubes to monitor tube wall thickness. The test results are compared to acceptance criteria, and are trended to project tube wall thickness to the next inspection. The staff finds that these activities will provide timely detection of loss of material in the heat exchanger tubes so that corrective actions can be taken prior to a loss of component intended function. On the basis of its review of the plant-specific and industry operating experience, the staff finds that the applicant’s Heat Exchanger Monitoring program activities are acceptable to manage aging of the components within the scope of this program.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.16, the applicant provided the UFSAR supplement for the Heat Exchanger Monitoring Program. The staff reviewed the applicant’s license renewal commitment list in LRA Amendment 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the implementation of the Heat Exchanger Monitoring Program is identified as Commitment No. 7, to be implemented before the period of extended operation. The staff reviewed this section and determined that the information in the UFSAR supplement provides 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 Heat Exchanger Monitoring Program, the staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 7, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.2 Containment Inservice Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.16.1 describes the existing, plant-specific Containment Inservice Inspection Program.

The program uses nondestructive examination techniques to detect and characterize flaws. Three different types of examinations are volumetric, surface, and visual. The volumetric are the most extensive with radiographic, ultrasonic, or eddy current examinations to detect surface and subsurface flaws. Surface examinations like magnetic particle or dye penetrant testing detect surface flaws. There are three specified levels of visual examinations. The VT-1 visual examination assesses the surface condition for cracks and symptoms of wear, corrosion, erosion, or physical damage. VT-1 can be done with either direct visual observation or remote examination by various optical/video devices. The VT-2 examination specifically locates evidence of leakage from pressure-retaining components (period pressure tests). While the system is under pressure for a leakage test, visual examinations detect direct or indirect indications of leakage. The VT-3 examination determines the general mechanical and structural condition of components and supports and detects discontinuities and imperfections. For containment ISI, general visual and detailed visual in addition to VT examinations are used.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in LRA Section B.1.16.1 regarding the applicant's demonstration of the Containment Inservice Inspection Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff reviewed the Containment Inservice Inspection Program against the AMP elements found in the GALL Report, SRP-LR Section A.1.2.3, and SRP-LR Table A.1-1, focusing its review on how the program manages aging effects through the effective incorporation of 10 elements (i.e., "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," "administrative controls," and "operating experience").

The applicant indicated that the "corrective actions," "confirmation process," and "administrative controls" program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program ("corrective actions," "confirmation process," and "administrative controls," program elements) is discussed in SER Section 3.0.4.

(1) Scope of Program - The applicant stated that in LRA Section B.1.16.1, for the "scope of program" program element, that this program, under ASME Code Section XI,

Subsection IWE, manages loss of material for the primary containment and its integral attachments. The primary containment is a GE Mark I pressure suppression containment system. The system consists of a drywell (housing the RV and reactor coolant recirculation loops), a pressure suppression chamber (housing a water pool), and the connecting vent system between the drywell and the water pool, isolation valves, and containment cooling systems. The code of construction for the containment structure is the ASME Code Section III, 1968 Edition, including the 1968 Summer Addenda.

During the audit and review, the staff asked the applicant the following for this program: (1) identify the supports that are currently in the program, (2) identify the supports that will be added to the scope, (3) specify the current inspection program and describe the current inspection details for the MC supports that are identified in (2) above, and(4) confirm that, all MC supports will be included within the scope of this inspection program.

In its response, the applicant stated: (1) Currently, JAFNPP has 16 torus saddle supports, 4 torus earthquake ties and 8 upper drywell stabilizer supports, (2) All torus supports, earthquake ties and upper drywell stabilizer supports are currently scheduled for examination during the 4^{th} ten-year inspection interval and will be in accordance with ASME Section XI, 2001 Edition with 2003 Addenda. There are no other supports added, (3) The current IWE program was developed in accordance with ASME Section XI, 1998 Edition with 1998 Addenda, which required 100% to be inspected either prior to and/or during RFO17 in 2008, (4) All torus supports, earthquake ties, and upper drywell stabilizer supports continue to be examined during the period of extended operation.

The staff reviewed the above applicant's response and Aging Management Review Evaluation Report JAF-RPT-05-LRD02, Revision 4, and determined that the specific components for which the program manages aging effects are identified by the applicant, which satisfies the criterion as defined in SRP-LR Appendix A.1.2.3.1.

The staff confirmed that the “scope of program” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff concludes that this program element is acceptable.

(2) Preventive Actions - In LRA Section B.1.16.1, the applicant stated that for the “preventive actions“ program element, this program is a monitoring program that does not include preventive actions.

The staff found that the applicant’s Containment Inservice Inspection Program is only an inspection program and the inspections performed under this program will only monitor the condition of the primary containment and its integral attachments and will not perform any preventive or mitigating action for aging effects/mechanisms. On this basis, the staff found the applicant’s "preventive actions" program element is acceptable.

The staff confirmed that the “preventive actions” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff concludes that this program element is acceptable.

(3) Parameters Monitored or Inspected - In LRA Section B.1.16.1, the applicant stated that for the “parameters monitored/inspected” program element, the primary containment and its attachments are inspected for evidence of cracks, wear, and corrosion.

The staff determined that the applicant's program element “parameters monitored/inspected” are identified and linked to the degradation of its intended functions. This satisfies the criteria defined in SRP-LR Appendix A.1.2.3.3. On this basis, the staff found that the applicant’s description of the “parameters monitored/inspected” is acceptable.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff concludes that this program element is acceptable.

(4) Detection of Aging Effects - In LRA Section B.1.16.1, the applicant stated that for the “detection of aging effects” program element, the Containment Inservice Inspection Program manages loss of material and cracking for the primary containment and its integral attachments.

The primary inspection method for the primary containment and its integral attachments is visual examination. Visual examinations are performed either directly or remotely, with sufficient illumination and resolution suitable for the local environment, to assess general conditions that may affect either the containment structure integrity or leak tightness of the pressure-retaining component. The program includes augmented ultrasonic examinations to measure wall thickness of the containment structure.

For steel, the Containment Inservice Inspection Program manages loss of material and cracking for ASME Code class MC pressure-retaining steel components and their integral attachments. This aging effect is managed by visual inspections required by ASME Code Section XI, Subsection IWE.

During the audit and review, the staff asked the applicant to clarify what Entergy had done to augment its ISI program requirements for IWE components and justify why the augmented program is considered to be capable of detecting the aging effects of concern. In its response, the applicant stated: "Augmented Containment Inspection Program for examinations other than those required by IWE-1241, JAFNPP has implemented a sub-tier augmented inspection plan, based on the HPCI and reactor core isolation cooling (RCIC) actuation requiring ultrasonic examination of the torus from the exterior surface.”

The applicant stated that JAFNPP’s drywell interior surfaces are examined for degradation every outage in accordance with ASME Code Section XI, 1998 Edition with 1998 Addenda, Subsection IWE requirements for class MC and metallic liners of class CC components of light-water cooled plants. In general, the overall coating of the steel surface is in good condition. There are small areas (less than 2 square feet in size) of flaking and peeled paint from various elevations, and the wall section behind the “A’ and “B” Cooling Filters shows signs of rust staining on the coating from elevation 268’-0” to elevation 256’-6”. The rust color staining is from the condensation forming on the

cooling lines to the filters. The piping behind the Cooling “A” and “B” Filters were cleaned and two of the pipe lines were painted. However, the JAFNPP primary containment system is inerted with nitrogen gas during normal power operations so that oxygen levels are maintained at less than 4 percent. Inerting with nitrogen provides an atmosphere that is not conducive to corrosion of containment interior surfaces. With such a low oxygen level the oxidation of the steel is diminished. The staff finds acceptable the applicant's assessment since the aging effect is managed by visual inspections required by ASME Code Section XI, Subsection IWE and the fact that the containment is inerted with nitrogen which provides an atmosphere that is not conducive to corrosion of containment interior surfaces. On this basis, the staff found that the applicant’s description of the “detection of aging effects” is acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff concludes that this program element is acceptable.

(5) Monitoring and Trending - In LRA Section B.1.16.1, the applicant stated that for the “monitoring and trending” program element, the results are compared, as appropriate, to baseline data and other previous test results. If indications are accepted for continued use by analytical evaluation, the areas containing such flaws are monitored during successive inspection periods.

During the audit and review, the staff asked the applicant to explain how inspections are performed in the torus suppression pool above and below the water line and to explain historically what inspection findings have led JAFNPP to perform augmented inspections. In its response, the applicant stated: “The interior torus suppression pool area above and below the water line are inspected in accordance with the IWE program during refueling outages. A general visual examination is performed of the area above the water line. Below the water line is normally inaccessible unless the torus water level is lowered or drained for a work activity. The torus was last drained and cleaned in 1998 for the installation of the emergency core cooling system strainers. The visual examination identified nine of the most severe areas of pitting. The depths of the pits were measured at that time and a portion of those areas are monitored and measured by means of UT from the outside of the torus shell every outage. Over a five years period, all nine of the pitted areas are examined by performing UT and found to be accepted in accordance to the Code requirements.”

The staff also asked the applicant, during the audit and review, to provide any information regarding the applicant’s actions in response to GL 87-05 and other industry operating experience including actions planned as a result of recent staff guidance (LR-ISG-2006-01) to address the potential loss of material due to corrosion in inaccessible areas of Mark I steel drywell liner shell for the period of extended operation. In its response, the applicant stated: "Two inspections were required per GL 87-05 prior to start-up from the 1988 refueling outage. The first being inspection of the eight(8) 2" diameter sand cushion drain lines and the second being inspection of the six (6) refueling bellows leakage drain lines. The inspections using a flexible boroscope were performed to determine that the drains were unplugged and functioning as designed. All eight sand cushion drain lines were inspected and seven of the eight were found to be

operable. Five of the six refueling bellows leakage drain lines were inspected and found to be operable. Inspection ports were installed prior to the inspection in five of six lines. One inspection port was not installed in the sixth line because it was inaccessible. The sand cushion is covered with stainless steel plates and an adhesive seal to prevent in-leakage. Drains are provided immediately above these plates and also at the bottom of the sand cushion. Because of this design arrangement, no Ultrasonic thickness were performed for the drywell shell plates adjacent to the sand cushion. All of the drain connections are welded; therefore, the are no gasket inspections or maintenance required."

During the audit and review, the staff also asked the applicant to explain, if water leakage has ever been discovered between the drywell and concrete secondary shield wall or in the sand pocket area. Also, to explain what JAFNPP does to inspect for water leakage in these two areas or to verify that loss of material is not occurring on the backside of the drywell. In its response, the applicant stated that there has been no observed leakage causing moisture in the vicinity of the sand cushion and no moisture has been detected or suspected on the inaccessible areas of the drywell shell. Further, any potential leakage through the refueling bellows assembly is directed to a drain system. Therefore, no additional components have been identified that require an AMR as a source of moisture that might affect the drywell shell in the lower region. In 1988, JAFNPP also examined the air gap with a boroscope through the drain lines and did not find any evidence of moisture in the air gap or corrosion of the drywell shell. It should be noted that the bellows drain lines are welded in place and have no gaskets that can leak, as existed at the Oyster Creek station.

To ensure the drywell shell exterior remains dry during refueling evolutions, the drywell to reactor building bellows assembly separates the refueling cavity filled with water from the exterior surface of the drywell shell. Any leakage through the bellows assembly is directed to a drain system ((inner bellows to the Drywell Equipment Drain Sump, outer bellows to the “B” Condensate Storage Tank), where two lines are each equipped with a flow indicator/switch that will alarm in the Control Room in the event of a bellows failure. A Preventive Maintenance - “Test 19FIS-61 prior to initial refuel cavity flood-up” is performed every outage to verify the indicator/switch is functional and the Control Room annunciator responds when water is added to the line. In addition, a Preventive Maintenance – Functional Test of 19FIS-62 is performed every two years to verify the indicator/switch and associated Control Room annunciator are functional.

The staff finds the applicant's responses and assessments since, all accessible surfaces are monitored by virtue of the examination requirements on a scheduled basis. The monitoring and trending of the drywell shell liner plate are in addition to the current JAFNPP ASME Code Section XI, Subsection IWE procedural requirements. These inspections will provide additional assurance that there is no loss of intended function of the drywell shell. On this basis, the staff found that the applicant’s description of the “monitoring and trending” is acceptable.

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff concludes that this program element is acceptable.

(6) Acceptance Criteria - In LRA Section B.1.16.1, the applicant stated that for the "acceptance criteria" program element, the results are compared, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Code Section XI, Subsection IWE, for evaluation of any evidence of degradation.

The staff reviewed this program element to determine whether or not it satisfied the criteria defined in SRP-LR Appendix A.1.2.3.6. In its letter dated February 12, 2007, (Amendment 6), the applicant stated the following:

JAFNPP inspects the liner drains for the water reservoirs on the refuel floor (e.g., spent fuel pool, dryer/separator pool, and reactor cavity) for leakage. Leakage into the liner drain could be a precursor for water leaks, which could wet the drywell shell exterior surface. These drains are examined for leakage after filling the refueling cavity. The code requires owners to identify locations they believe are suspect or potential problem areas for augmented inspection. Program at two locations in the upper drywell immediately adjacent to the fuel pool due to the potential for leakage from the fuel pool liner. The drywell shell to floor joint is inspected accordance with ASME Code Section XI, 1998 Edition with 1998 Addenda, Subsection IWE requirements for class MC and metallic liners of class CC components of light-water cooled plants under the JAFNPP IWE Program.

The staff found that the applicant's description of the "acceptance criteria" is consistent with SRP-LR Section A.1.2.3.6. and is acceptable.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff concludes that this program element is acceptable.

(10) Operating Experience - LRA Section B.1.16.1 states that the containment ISI general visual walk-down of the primary containment during RO15 (2002) and RO16 (2004) revealed minor areas of peeling paint and rust scale but no significant loss of material. Work was requested to repaint the affected areas as necessary. The torus interior general visual inspection and torus exterior inspection and ultrasonic examination revealed no significant loss of material or unacceptable indications. Absence of loss of material proves that the program is effective for managing aging effects. A self-assessment in 2004 revealed no issues or findings with impact on program effectiveness.

The applicant stated that JAFNPP monitors torus wall thickness via the inclusion of augmented UT thickness examinations in the JAFNPP IWE Program. During refueling outage RFO-16 (2004), the applicant performed thickness examinations at nine pitted locations identified during 1996 IWE examination (two at "B" bay, two at "H" bay, two at "K" bay, and three at "O" bay around the torus). The applicant found that only three locations were below design (0.632"), with measured pitted depths of 0.019", 0.014" and 0.010".

During the audit and review, the staff asked the applicant to address the operating experience such as crack on the torus shell identified on June 27, 2005. In its response,

the applicant stated that " the JAFNPP torus preservation verifies that sample locations are tracked for wall thinning. The reports are in NDE database and used to assure adequate wall thickness. IWE examinations are performed and any discrepancies noted in coatings are repaired using the CR system. The torus was repaired in July 2005 using a cap and removing the damaged section of shell. The root cause analysis determined condensation oscillation from the HPCI Turbine Steam Discharge provided the energy that initiated the cracking. UT was subsequently performed at this location and at the RCIC discharge each time they were run. In RFO-17 a VT was scheduled on the extend of condition and two cracked were noted near the HPCI discharge line was modified with a sparger assembly which is designed to eliminate condensation oscillation. JAF documentation can be found under CR-JAF-05-2593, CR-JAF-06-4526 (WO-JAF-05-24673 and WO-JAF-06-28641, respectively). Additional to the above, some minor surface rust/corrosion and areas of deteriorated coatings were evaluated and found acceptable by the responsible design engineer."

The applicant also stated in Amendment No. 6 to the LRA dated February 12, 2007, that:

> There has been no observed active leakage causing moisture in the vicinity of the sand cushion drain line at JAF as monitored by IWE general visual examination of the exterior of the torus and torus room. No moisture has been detected or suspected on the inaccessible areas of the drywell shell. Any leakage through the refueling bellows assembly is directed to a drain system (inner bellows to the Drywell Equipment Drain Sump, outer bellows to the “B” Condensate Storage Tank). Therefore, no additional components have been identified that require AMR as a source of moisture that may affect the drywell shell in the lower region.
>
> In 1988, JAF examined the air gap through the drain lines using fiber optic cables and did not have any evidence of moisture potentially causing corrosion of the drywell shell (Reference NYPA Memorandum No. JTS-88-0875, from V. Walz to W. Fernandez, dated November 1, 1988). JAF plans to perform an additional examination in 2007 (Reference maintenance work order WO # JAF-07-14863. If any evidence of moisture is identified JAF will determine additional inspection activities, as appropriate.
>
> JAF monitors refueling bellows leakage drain lines during every refueling outage. Flow indicator/switches 19FIS-61 and 19FIS-62 were successfully last tested in 2006. The flow indicators/switches are on a two year PM frequency.
>
> Drywell interior surfaces are examined for degradation every refueling outage in accordance with the JAF IWE Program. A general visual examination has been performed every refueling outage looking at the steel and concrete surfaces for shrinkage cracks in the concrete, cracking and peeling coating, and discoloration of the surface coating (bleed through, staining). There were areas of minor corrosion bleed

though the coating (less than 4 square feet) and staining (less than 50 square feet) caused by condensation from the “A” and “B” Cooling filter lines. The areas of peeling and flaking paint are less than 2 square feet areas. Engineering evaluated the minor surface condition at various locations and were found to be acceptable. The minor degraded areas are monitored every refueling outage.

The drywell shell to floor caulked seal is inspected every refueling outage. A general visual examination is performed looking for cracking, peeling, delaminating or separation of the seal, discoloration in the caulking material, and flexibility of the caulking. The caulk seal has not been removed or replaced.

The staff reviewed the operating experience provided in the LRA and the above amendment and interviewed the applicant’s technical staff to confirm that the plant-specific operating experience did not reveal any degradation not bounded by industry experience.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s Containment Inservice 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 SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

UFSAR Supplement. The applicant provided its UFSAR supplement for the Containment Inservice Inspection Program in LRA Section A.2.1.17. It outlines the requirements for the inspection of class MC pressure-retaining components (primary containment) and their integral attachments in accordance with the requirements of 10 CFR 50.55a(b)(2) and ASME Code Section XI, 1992 Edition with no Addenda, Inspection Program B.

The primary inspection method for the primary containment and its integral attachments is visual examination. Visual examinations are performed either directly or remotely with illumination and resolution suitable for the local environment to assess general conditions that may affect either the integrity of the containment structure or leak tightness of the pressure-retaining component. The program includes augmented ultrasonic exams to measure wall thickness of the containment drywell structure. The staff reviewed this section and determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant’s Containment Inservice Inspection Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.3 Inservice Inspection Program

Summary of Technical Information in the Application. LRA Section B.1.16.2 describes the existing, plant-specific Inservice Inspection Program.

The Inservice Inspection Program is a plant-specific program encompassing ASME Code Section XI, Subsections IWA, IWB, IWC, IWD and IWF requirements.

Section 50.55a of 10 CFR, imposes ISI requirements of ASME Code, Section XI, for Class 1, 2, and 3 pressure-retaining components, their integral attachments, and supports in light-water cooled power plants. Inspection, repair, and replacement of these components are covered in Subsections IWB, IWC, IWD, and IWF respectively. The program includes periodic visual, surface, and volumetric examination and leakage tests of Class 1, 2, and 3 pressure-retaining components, their integral attachments and supports. Inservice inspection of supports for ASME piping and components is addressed in Section XI, Subsection IWF. ASME Code Section XI, Subsection IWF and constitutes an existing mandated program applicable to managing aging of ASME Class 1, 2, 3, and MC supports for license renewal.

The program uses NDE techniques to detect and characterize flaws. Three different types of examinations are volumetric, surface, and visual. Volumetric examinations are the most extensive, using methods such as radiographic, ultrasonic or eddy current examinations to locate surface and subsurface flaws. Surface examinations, such as magnetic particle or dye penetrant testing, are used to locate surface flaws. Three levels of visual examinations are specified. VT-1 visual examination is conducted to assess condition of the surface of the part being examined, looking for cracks and symptoms of wear, corrosion, erosion or physical damage. It can be done with either direct visual observation or with remote examination using various optical/video devices. The VT-2 examination is conducted specifically to locate evidence of leakage from pressure retaining components (period pressure tests). While the system is under pressure for a leakage test, visual examinations are conducted to detect direct or indirect indication of leakage. The VT-3 examination is conducted to determine the general mechanical and structural condition of components and supports and to detect discontinuities and imperfections.

The Inservce Inspection Program is based on ASME Inspection Program B (IWA-2432), which has 10-year inspection intervals. Every 10 years the program is updated to the latest ASME Section XI code edition and addendum in accordance with 10 CFR 50.55a. On September 28, 1997, JAFNPP entered the third ISI interval. The ASME code edition and addenda used for the third interval is the 1989 Edition with no addenda. The current program ensures that the structural integrity of Class 1, 2, and 3 systems and associated supports is maintained at the level required by 10 CFR 50.55a.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in LRA Section B.1.16.2 regarding the applicant’s demonstration of the Inservice Inspection Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

During the audit and review, the staff reviewed the Inservice Inspection Program against the AMP elements found in the GALL Report, SRP-LR Section A.1.2.3, and SRP-LR Table A.1-1, focusing its review on how the program manages aging effects through the effective incorporation of 10 elements as described in SER Section 3.0.2.1. The staff also interviewed the applicant's technical staff and reviewed program basis document which provides the bases for program element criteria defined in the GALL Report and SRP-LR Section A.1.2.3.6.

The applicant indicated that the "corrective actions," "confirmation process," and "administrative controls" program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is discussed in SER Section 3.0.4. The remaining seven elements are discussed below.

(1) Scope of the Program - In LRA Section B.1.16.2, the applicant stated that the Inservice Inspection Program is credited with the management of loss of material, cracking, and reduction of fracture toughness properties in the piping, components, and supports of the reactor coolant system and that the AMP implements the requirements of Section XI of the ASME Boiler and Pressure Vessel Code (henceforth Section XI), Subsections IWB, IWC, IWD, and IWF, as required by 10 CFR 50.55a. The applicant also stated that the program includes applicable relief requests and alternative programs as approved in accordance with 10 CFR 50.55a and that the Section XI Edition of record is updated once every ten years.

The staff noted that the 3rd 10-Year ISI Interval for JAFNPP was the ISI interval in effect at the time of the staff's AMP audit, which was performed during the week of December 12-18, 2006. The staff reviewed the applicant's procedure for implementing the ISI Program during the 3rd 10-Year ISI Interval for JAFNPP reflected in quality Procedure JAF-ISI-0002, "JAFNPP Third Ten-Year In-service Interval Inspection Program," Revision 4, April 20, 2005. The applicant updates this procedure through the applicant's 10 CFR 50.59 process prior to entering the subsequent 10-Year ISI Interval for JAFNPP to ensure that the applicant will continue to implement its ISI Program in compliance with the requirements of 10 CFR 50.55a.

The applicant entered the 4th Ten-Year ISI Interval for JAFNPP in January 2007. The applicant was required by 10 CFR 50.55a(g)(4)(I) to update the ASME Code, Section XI (Section XI code of record) to the 2001 Edition of Section XI, inclusive of the 2003 Addenda. The staff requested clarification from the applicant on whether the Section XI code of record for the 4th Ten-Year ISI Interval is the 2001 Edition of Section XI, inclusive of the 2003 Addenda.

The applicant clarified that the 2001 Edition of Section XI, inclusive of the 2003 Addenda will be the new Section XI code of record for those JAFNPP AMPs referencing or crediting Section XI requirements. The applicant also stated that LRA Section A.2.1.18 will be amended to delete the relevant information for the 3rd 10-Year ISI Interval and to incorporate the relevant information for the 4th 10-year ISI Interval for JAFNPP, including a statement that the 2001 Edition of Section XI, inclusive of the 2003 Addenda is the applicable edition of Section XI for the 4th 10-Year ISI Interval. Use of the 2001 Edition of the AMSE Code Section XI, inclusive of the 2003 Addenda, is consistent with edition of the ASME Code Section XI referenced in GALL AMP XI.M1, "ASME Section XI

Inservice Inspection, Subsections IWB, IWC, and IWD." The applicant amended the LRA (Amendment 5) in its letter dated February 1, 2007, in order to reflect the change in the ASME Code Section XI edition of record referenced for the 4th 10-Year ISI Interval.

The staff concludes that the changes to the LRA are acceptable because they are in compliance with the requirements of 10 CFR 50.55a and in conformance (i.e., consistent) with the "scope of program" element in GALL AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."

The staff determined that Procedure JAF-ISI-0002, Revision 4, provides requirements, elements, criteria, and descriptions that if implemented, would be in compliance with the requirements of 10 CFR 50.55a and the ASME Code Section XI for JAFNPP systems or portions of JAFNPP systems categorized as ASME Code Class 1, 2, or 3, or their component supports. However, the staff also determined that the applicant's "scope of program" attribute for the ISI Program in the LRA implied that the reactor coolant system (RCS) was the only JAFNPP system within the scope of the ISI program and that the Section XI requirements in Subsections IWB, IWC, IWD, and IWF applied to the components in all portions of the RCS.

The staff reviewed the AMR tables for the RCS, emergency safety feature systems, auxiliary systems, and steam and power conversion system in the LRA and confirmed that the applicant's ISI Program is credited only with aging management of particular commodity groups in the AMR tables for the RCS (i.e., in LRA AMR Tables 3.1.2-1, 3.1.2-2, and 3.1.2-3). The staff sought further clarification about the other systems and components that are within the ISI program and their ASME code classifications. During the audit and review, the staff asked the applicant to identify all JAFNPP systems and components that are within the scope of the ISI and to identify exactly which ASME Code Classifications were applicable to these systems and components.

The applicant clarified in its response that the systems within the scope of the ISI Program include:

- flow diagram reactor building service water cooling system
- control room area-service and chilled water system
- reactor building cooling water system
- pass cooling water supply system
- fuel pooling cooling (FPC) system
- core spray (CS) system
- SLC system
- RCIC system
- RWCU system
- RHR system
- HPCI system
- reactor water recirculation system
- CRD system
- feedwater system
- service water (SW) system
- emergency service water (ESW) system

- nuclear boiler vessel instrumentation (NBVI)
- emergency diesel generator fuel oil and combustion air systems
- emergency diesel generator and lubricating systems
- emergency diesel generator air start-up lines

The applicant, in addition, confirmed that the ISI program also incorporates Section XI requirements pursuant to10 CFR 50.55a for the portions of these systems that are part of the reactor coolant pressure boundary (i.e., that are categorized ASME Code Class 1) and for systems or portions of systems categorized as ASME Code Class 2 and 3, even though the program is not credited for aging management for ASME Code Class 2 and 3 systems and components or their component supports. The scope of the AMP also includes the component supports for ASME Code Class 1, 2, and 3 components. This is in compliance with 10 CFR 50.55a and is acceptable.

JAFNPP completed its 3rd Ten-Year ISI Interval for the plant in December 2006 and entered the 4th 10-Year ISI Interval in January of 2007.

In RAI B.1.16.2 dated November 7, 2006, the staff informed the applicant that the staff's approval of any alternative programs or relief requests granted for these 10-Year intervals do not extend into the period of extended operation for JAFNPP or its two 10-year ISI intervals (i.e., do not extend into the 5th and 6th 10-year ISI intervals for the plant).

During the audit and review, the staff asked the applicant to either amend the LRA to remove any reference to past staff-approved relief requests or alternative ISI provisions or else provide a commitment on the LRA that if relief requests or alternative programs are sought for the period of extended operation, the relief requests or alternative programs will be submitted for staff review and approval pursuant to the applicable requirements of 10 CFR 50.55a, unless they have been incorporated in the code of record for JAFNPP or are covered by endorsed code cases.

In a letter dated February 1, 2007 (Amendment 5), the applicant provided its response to RAI B.1.16.2. In its response, the applicant removed the reference to the relief requests or alternative ISI provisions via amending LRA Section B.1.16.2.

This staff finds the applicants response to RAI B.1.16.6 acceptable because the relief requests or alternative programs will be submitted for staff review and approval pursuant to the applicable requirements of 10 CFR 50.55a.

Based on this assessment, the staff concludes that the scope of the ISI program is acceptable because the AMP is credited with the aging management of loss of material, cracking, and reduction of fracture toughness in the components of the RCPB (i.e, ASME Code Class 1 components) and their component supports, which is in conformance with the AMR line items in GALL Report, Revision 1 for which this program is recommended for aging management. In addition, the staff has confirmed that, even though the ISI program is not credited with the aging management of the AMR commodity groups for the emergency safety features, auxiliary systems, and S&PC system, the scope of the program does include those portions of these systems that are

categorized as ASME Code 2 or 3, as required by 10 CFR 50.55a.

Based on this assessment, the staff concluded that the “scope of program” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff concludes that this program element is acceptable.

(2) Preventive Actions - In LRA Section B.1.16.2, the applicant stated that the ISI Program is a condition monitoring and does not include preventive actions. ISI programs for US commercial nuclear power plants are invoked in accordance with the requirements Section XI, in compliance with10 CFR 50.55a. The ISI requirements of Section XI apply staff-approved NDE methods to inspect for degradation or age-related aging effects that could impact the structural integrity of ASME Code Class 1, 2, and 3 components and their component supports. The ISI requirements of Section XI do not involve required activities which prevent or mitigate these degradation effects or age-related aging effects from occurring.

Instead, the applicant implements its water chemistry program as the basis for mitigating the corrosive mechanisms that could induce loss of material or cracking in the ASME Code Class 1, 2, and 3 components at JAFNPP. The staff evaluates the ability of the applicant’s water chemistry program to mitigate the aging effects that are applicable to ASME Code Class 1, 2, and 3 components in SER Section 3.0.3.1.10.

Therefore, the staff finds it acceptable that the scope of the ISI Program for JAFNPP does not include preventive actions. Based on this assessment, the staff concludes that the “preventive actions” program element need not conform to the “preventive actions” program attribute criterion defined in SRP-LR Section A.1.2.3.2 and that the applicant’s “preventive actions” program attribute description for the ISI Program is acceptable.

(3&4) Parameters Monitored or Inspected and Detection of Aging Effects - In LRA Section B.1.16.2, the applicant stated that

> ... the ISI program manages cracking, loss of material, and reduction in fracture tough in reactor coolant system components made from carbon steel, low alloy steel, low alloy steel with stainless steel cladding, stainless steel, and nickel-based alloy materials.

ISI programs for U.S. commercial nuclear plants are based on the requirements of 10 CFR 50.55a, which invokes the ISI examinations in Section XI for components categorized as ASME Code Class 1, 2, and 3 components and their component supports. Section XI, Subsection IWA-2000 identifies particular NDE techniques to manage the mechanisms that could potentially lead to loss of material or cracking of ASME code Class 1, 2, and 3 components and their component supports. The staff concludes that it is acceptable to use the ISI program as an appropriate AMP for managing loss of material and cracking in these components because the mechanisms which could potentially lead to these aging effects are in compliance with those monitored for by the NDE methods invoked by Section XI, Subsection IWA-2000. These NDE methods are discussed in more detail later in this section.

As indicated in LRA Table 3.1.2-3, the applicant credits the ISI Program to manage reduction of fraction toughness in the following Class 1 commodity groups: (1) Class 1 pump casings and covers fabricated from cast austenitic stainless steel (CASS), and (2) Class 1 pump casing thermal barriers fabricated from CASS, (3) Class 1 CASS valve bodies less than 4 inches NPS made from CASS, and (4) Class 1 CASS valve bodies less than or equal to 4 inches NPS. Fracture toughness is a material property that is indicative of a material's ability to resist crack initiation. The fracture toughness of a material is normally established by drop weight or Charpy-V impact testing and analysis.

During the audit and review, the staff asked the applicant to clarify how the ISI program monitors for reduction (loss) of fracture toughness since the fracture toughness cannot be monitored by inspection methods.

Reduction of the fracture toughness property in CASS materials may occur by a mechanism known as thermal aging, in which the material embrittles as result of being exposed to high temperatures over a prolonged period of time. The applicant clarified in its response that the staff's position in its letter of May 19, 2000, from C. Grimes (NRC) to D. Walters (Nuclear Energy Institute [NEI]) will be used to manage reduction of fracture in these CASS pump casing and valve body components.

In its letter of May 19, 2000, the staff established its position that:

(1) CASS valves bodies and pump casing components "are adequately covered by existing inspection requirements in Section XI ..., including the alternative requirements of ASME Code Case N-481 for pump casings," and (2) "screening for susceptibility to thermal aging is not required." Based on this assessment, the applicant provided an acceptable basis for explaining how reduction of fracture toughness will be managed by the ISI Program in that the applicant is applying the staff's position in the staff letter of May 19, 2000, for managing potential reduction of fracture toughness due/thermal aging in the Class 1 CASS valve bodies and pump casing components.

In LRA Section B.1.16.2, the applicant also stated that "the ISI Program uses NDE examination techniques to monitor for and detect the aging effects that are applicable to the components within the scope of the program. The applicant stated that these NDE techniques include: (1) volumetric examination techniques such as radiography testing (RT), ultrasonic testing (UT), and eddy current testing (ET), (2) surface examination techniques, such as dye penetrant testing (PT) and magnetic particle testing (MT), and (3) visual examination methods, including ASME VT-1, VT-2, and VT-3 visual examination techniques. Of the visual inspection methods available for use, the applicant clarified in the LRA that:

(1) VT-1 techniques are used to assess the condition of the surface of the component being examined and to monitor for evidence of cracking, wear, corrosion, erosion, or physical damage

(2) VT-2 techniques are used to locate evidence of leakage from AMSE Code Class pressure boundary components

(3) VT-3 techniques are used to determine the general mechanical and structural

condition of components and supports and to detect discontinuities and imperfections.

ASME Code Section XI, Article IWA-2000,specifies that the NDE methods for ASME Code Class 1, 2, and 3 components and their component supports include the following techniques:

- volumetric techniques: radiography (RT), ultrasonic testing (UT), and eddy current testing (ET)
- surface examination techniques: magnetic particle testing (MT) and penetrant testing (PT)
- visual examination methods: ASME VT-1, VT-2, and VT-3 methods.

Of these NDE methods, the staff reviewed the NDE techniques invoked by Section XI, Subsection IWA-2000 and determined that this ASME subsection specifies that RT, UT, ET, PT, RT, and VT-1 (including enhanced VT-1 [EVT-1] are capable of monitoring for and identifying loss of material and cracking in ASME Code Class components. The staff also determined that ASME Subsection IWA-2000 specifies that VT-3 visual methods are capable of monitoring and identifying indications of loss of material in these components and that VT-2 visual methods are limited to monitoring for and identifying indications of leakage that may result from loss of component integrity.

The staff also determined that the criteria in JAFNPP Procedure JAF-ISI-0002, Revision 4, invoked the NDE methods in Section XI Article IWA-2000 for managing loss of material and cracking in ASME Code Class 1, 2, and 3 components and their component supports and the test and analysis criteria in Section XI for managing reduction of fracture toughness in the materials used to fabricate ASME Code Class 1 components or their component supports. This is acceptable because the applicant is using the appropriate criteria in Section XI for managing loss of material, cracking, and reduction of fracture toughness, as required by 10 CFR 50.55a.

Based on this assessment, the staff concludes that the applicant has appropriately identified the aging effects managed by the ISI Program for the period of extended operation and the techniques that may be used to manage loss of material, cracking, reduction of fracture toughness in ASME Code Class 1, 2, and 3 components and their component supports.

Based on this assessment, the staff confirmed that the “detection of aging effects” and “parameters monitored or inspected” program elements satisfy the criteria defined in SRP-LR Section A.1.2.3.3. The staff concludes that these program elements are acceptable.

(5) Monitoring and Trending - In LRA Section B.1.16.2, the applicant stated that

> ... results are compared, as appropriate, to baseline data and other previous test results. Indications are evaluated in accordance with ASME Section XI. If the component is qualified as acceptable for continued

service, the area containing the indication is reexamined during subsequent inspection periods. Examinations that reveal indications that exceed the acceptance standards are extended to include additional examinations in accordance with ASME Section XI. ISI results are recorded every operating cycle and provided to the NRC every period via Owner's Activity Reports. These detailed reports include scope of inspection and significant inspection results.

ASME Code Section XI includes series of tables that specify the NDE requirements for performing ISI of ASME Code Class 1, 2, and 3 components and their component supports. These tables are subdivided into specific examination categories and inspection items that specify the NDE methods, NDE sample sizes, and NDE frequencies for performing the required ISI examinations. These tables include:

- Table IWB-2500-1 of Section XI, Subsection IWB-2000 for components that are part of the reactor coolant pressure boundary (ASME Code Class 1 or ASME Safety Class A components).

  Table IWC-2500-1 of Section XI, Subsection IWC-2000 for components that are categorized as ASME Code Class 2 components (ASME Safety Class C components).
- Table IWD-2500-1 of Section XI, Subsection IWD-2000 for components that are categorized as ASME Code Class 2 components (ASME Safety Class D components).
- Table IWF-2500-1 of Section XI, Subsection IWF-2000 for ASME Code Class component supports.

The staff reviewed JAFNPP ISI Procedure JAF-ISI-0002, Revision 4, and confirmed that the procedure invokes the appropriate tables listed above for ASME Code Class 1, 2, and 3 components, the applicable examination categories and inspection items invoked by these tables, and the NDE methods, frequencies, and sample sizes required by these ISI examination categories and inspection items. The applicant’s ISI program provides an acceptable basis for monitoring and trending for indications of loss of material and cracking because it invokes the NDE methods, frequencies, and sample sizes for ASME Code Class components and component supports required by Section XI, in accordance with10 CFR 50.55a. The ISI Program also analyzes for reduction in the fracture toughness properties in the materials of components that are susceptible to neutron irradiation embrittlement or thermal aging. In addition, the ISI Program will also ensure that any cracks will be detected before they grow to a size in excess of the allowable flaw size (i.e., critical crack size) permitted by fracture toughness analysis.

Based on this assessment, the staff confirmed that the”monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff concludes that this program element is acceptable.

(6) Acceptance Criteria - In LRA Section B.1.16.2, the applicant stated that

> ... a preservice, or baseline, inspection of program components was performed prior to startup to assure freedom from defects greater than code-allowable. This baseline data also provides a basis for evaluating subsequent inservice inspection results. Since plant startup, additional inspection criteria for Class 2 and 3 components have been imposed by 10 CFR 50.55a for which baseline and inservice data has also been obtained. Results of inservice inspections are compared, as appropriate, to baseline data, other previous test results, and acceptance criteria of the ASME Section XI, 1989 Edition, no Addenda, for evaluation of any evidence of degradation.

In its letter dated February 1, 2007, the applicant clarified that the 2001 Edition of Section XI, inclusive of the 2003 Addenda will be the new Section XI code of record for those JAFNPP AMPs referencing or crediting Section XI requirements. The applicant also stated that LRA Section A.2.1.18 will be amended to delete the relevant information for the 3rd 10-Year ISI Interval and to incorporate the relevant information for the 4th 10-year ISI Interval for JAFNPP, including a statement that the 2001 Edition of Section XI, inclusive of the 2003 Addenda is the applicable edition of Section XI for the 4th 10-Year ISI Interval. The applicant amended the LRA (Amendment 5) in a letter dated February 1, 2007.

ASME Code Section XI includes particular flaw evaluation methods and acceptance criteria for evaluating flaws that are detected during the implementation of required ISI examinations. These methods and criteria include prescribed methods for sizing the flaws based on the ISI examinations results and flaw size acceptance criteria. The methods and acceptance criteria are given in the following ASME Code Section XI subsections:

- Article IWA-3000, which provides general “Standards for Evaluation Examinations”
- Article IWB-3000, which provides “Acceptance Standards for Flaw Indications” in ASME Code Class 1 components
- Article IWC-3000, which provides “Acceptance Standards for Flaw Indications” in ASME Code Class 2 components
- Article IWD-3000, which provides “Acceptance Standards for Flaw Indications” in ASME Code Class 3 components
- Article IWF-3000, which provides “Acceptance Standards for Flaw Indications” in ASME Code Class component supports

The applicant stated that if flaws are detected during an ISI examination, the flaws are evaluated for acceptance in accordance with the general acceptance criteria provisions of Section XI, Article IWA-3000 and the applicable provisions in Section XI Article IWB-3000, IWC-3000, IWD-3000, or IWF-3000, as applicable to the component’s ASME classification. This is acceptable because the applicant is applying the evaluation and

acceptance criteria of Section XI to the ASME Code Class 1, 2, and 3 components within the scope of the ISI program.

The staff confirmed that the"acceptance criteria" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff concludes that this program element is acceptable.

(10) Operating Experience - LRA Section B.1.16.2 states that "ISIs during RO15 (2002) detected a pipe support with as-built configuration discrepancies which were accepted by evaluation and reflected on applicable drawings. A visual inspection also detected loose spring and pipe support clamp nuts that were subsequently tightened. ISIs during RFO16 (2004) detected a few pipe supports with as-built configuration discrepancies which were accepted by evaluation and reflected on applicable drawings. Ultrasonic examination of a feedwater pipe-to-valve weld detected a subsurface planer indication which was accepted by evaluation. A self-assessment in 2004 revealed no issues or findings with impact on program effectiveness."

The staff reviewed the applicant's operating experience summaries in the operating experience reports.

During the audit and review, the staff asked the applicant to identify all relevant operating experience that is relevant to the JAFNPP ISI Program and was used to augment the requirements of the ISI Program, other than the augmented inspection and flaw evaluation guidelines for the reactor vessel and its internals, which are evaluated in SER Section 3.0.3.2.7.

The applicant identified in its response that the following augmented inspections are performed at JAFNPP based on programmatic requirements or operating experience results for JAFNPP.

- Risk-informed inspections of pressure retaining dissimilar metal welds in Class 1 components (i.e., bimetallic welds or inconel alloy welds, such as those made from Alloy 82, 182, 52, or 152) in accordance with Section XI Category B-F, including inspections for the occurrence of intergranular stress corrosion cracking (IGSCC)
- Risk-informed inspections of pressure retaining in Class 1 piping components in accordance with Section XI Category B-J, including inspections for the occurrence of IGSCC
- Risk-informed inspections of pressure retaining in Class 2 piping components in accordance with Section XI Category C-F, including inspections for the occurrence of IGSCC
- augmented examinations of core spray pump discharge piping welds that are considered to be potentially susceptible to vibration-induced cracking (i.e., high cycle fatigue-induced cracking)
- augmented inspection of the Class 1 feedwater (FW) nozzles in accordance with the requirements of Section XI IWB and the industry recommendations in

General Electric (GE) Report NE-523-A71-0594.

The applicant stated that an ISI examination of feedwater pipe-to-pump weld 18-34-289 identified the presence of a subsurface planer flaw in the component. The applicant stated that an evaluation of the flaw was performed and that the evaluation indicated that the flaw was acceptable for further service.

During the audit and review, the staff also asked the applicant to clarify what type of analysis, if any, was performed in evaluation of this flaw, and, if applicable, to identify whether or not the evaluation of the flaw indication was a TLAA in accordance with10 CFR 54.3.

In its response, the applicant stated that the UT inspection result that had identified the flaw indication was correlated back to a slag inclusion that was originally identified during the construction radiograph (i.e., RT examination) of this pipe weld and that the UT results were determined to be acceptable in accordance with Section XI, paragraph IWB-3112(b).

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's Inservice 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 SRP-LR Section A.1.2.3.10 and found this program element acceptable.

UFSAR Supplement. In LRA Section A.2.1.18 and in LRA Amendment No. 5, dated February 1, 2007, the applicant provided the UFSAR supplement for the Inservice Inspection Program. The staff reviewed this section and determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Inservice Inspection Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.4 Periodic Surveillance and Preventive Maintenance Program

Summary of Technical Information in the Application. LRA Section B.1.22 describes the existing plant-specific Periodic Surveillance and Preventive Maintenance Program.

This program includes periodic inspections and tests that manage aging effects not managed by other AMPs. Preventive maintenance and surveillance are generally implemented through repetitive tasks or routine monitoring of plant operations. The program takes credit for AMR of the following systems and structures:

Reactor building	Perform visual or other non-destructive examination to manage loss of material for carbon steel components within the reactor building battery racks framing, reactor building crane, rails, and girders, equipment access lock doors, and refueling platform.
Reactor building	Perform visual inspection and manually flex a representative sample of the elastomer seals for equipment lock doors at reactor track bay inner & outer doors to manage cracking and change in material properties.
Core spray system	Monitor core spray piping per the existing augmented flow accelerated corrosion program.
Automatic depressurization system	Use visual or other NDE techniques to inspect torus to manage loss of material for carbon steel piping and T-quenchers in the waterline region of the torus.
High pressure coolant injection (HPCI) system	Monitor HPCI piping per the existing augmented flow accelerated corrosion program.
Reactor core isolation cooling (RCIC) system	Monitor RCIC piping per the existing augmented flow accelerated corrosion program.
Standby gas treatment (SGT) system	Use visual or other NDE techniques to inspect a representative sample of internal surfaces of the valve bodies and piping in the demister drains and in drain piping downstream of the fans to manage loss of material. Use visual or other NDE techniques to inspect a representative sample of internal surfaces of piping and valves in the vent piping and from the stack analyzer sample chambers including loop seals. Use visual or other NDE techniques to inspect a representative sample of internal surfaces of piping downstream of the SGT fans between the drain and the outlet of the stack sump. Use visual or other NDE techniques to inspect a representative sample of internal surfaces of piping, valves and flow elements in the discharge piping from the steam packing exhauster and the condenser air removal pumps to the SGT discharge piping to the stack.
Primary containment atmosphere control and dilution system	Use visual or other NDE techniques to inspect a representative sample of heat exchanger coil external surfaces on 27E-1A/B, 27NV-A/B, 27PBC-1A/B
Emergency diesel generator system	Use visual or other NDE techniques to inspect a representative sample of EDG intake air, air start, and exhaust components to manage loss of material (air start and exhaust) fouling, loss of material, cracking, and change in properties (intake air), and cracking (exhaust).
Heating, ventilation, and air conditioning (HVAC) systems	Visually inspect and manually flex a representative sample of the HVAC duct flexible connections to manage cracking and change in material properties. Use visual or other NDE techniques to inspect a representative sample of coils, housings, drip pans, and fins to manage loss of material and to manage fouling of the tubes and fins for air handling units (AHU) 70AHU-3A & B, 70AHU-12A & B, 70AHU-19A, B. Test chiller performance and inspect tube external surfaces to manage loss of material and fouling for heat exchanger portions of control and relay room

	chillers 70RWC-2A(EVP), 70RWC-2B(EVP). Test chiller performance and inspect tube external surfaces to manage loss of material and fouling for heat exchanger portions of control and relay room chillers 70RWC-2A(CND), 70RWC-2B(CND).
Plant drains system	Use visual or other NDE techniques to inspect a representative sample of the floor drain components that provide a drain path for fire suppression water from floor drains to the floor drain collection tank or to the yard drain system to manage loss of material.
Radwaste	Use visual or other NDE techniques to inspect a representative sample of internal surfaces of X-18 and X-19 penetration components to manage loss of material.
Security generator system	Use visual or other NDE techniques to inspect a representative sample of security generator exhaust components to manage cracking and loss of material on internal surfaces. Perform security generator operability test to manage fouling for heat exchanger tubes. Use visual or other NDE techniques to inspect the surface condition of the radiator tubes to manage loss of material on external surfaces.
Nonsafety-related systems affecting safety-related systems	Use visual or other NDE techniques to inspect a representative sample of radioactive waste, circulating water, turbine closed loop cooling, raw water treatment, contaminated equipment drain, service water, turbine building ventilation, administration building ventilation and cooling, plumbing, sanitary and lab, and city water system components to manage internal loss of material.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in LRA Section B.1.22 regarding the applicant’s demonstration of the Periodic Surveillance and Preventive Maintenance Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

The staff interviewed the applicant's technical staff and reviewed program basis document which provides an assessment for each of the AMP elements.

During the audit and review, the staff reviewed the Periodic Surveillance and Preventive Maintenance Program against the AMP elements found in the GALL Report, SRP-LR Section A.1.2.3, and SRP-LR Table A.1-1, focusing its review on how the program manages aging effects through the effective incorporation of 10 elements (i.e., “scope of program,” “preventive actions,” “parameters monitored or inspected,” “detection of aging effects,” “monitoring and trending,” “acceptance criteria,” “corrective actions,” “confirmation process,” “administrative controls,” and “operating experience”).

The applicant indicated that the “corrective actions,” “confirmation process,” and “administrative controls” program elements are parts of the site-controlled QA program. The staff’s evaluation of the QA program is discussed in SER Section 3.0.4. The remaining seven elements are

discussed below.

(1) Scope of the Program - In LRA Section B.1.22, the applicant stated that the JAFNPP Periodic Surveillance and Preventive Maintenance Program, with regard to license renewal, includes those tasks credited with managing aging effects identified in AMRs.

The staff reviewed the applicant's program basis document for this program and noted that Attachment 3 includes a table that identifies the plant surveillance and PM activities included in the program, along with the components inspected or maintained, and the parameters monitored to address aging effects. The table also includes a description of the surveillance or PM activities that will be performed, and the acceptance criteria that will be used to determine if the component's condition is acceptable. The staff reviewed this table and determined that it includes sufficient detail to define the scope of this AMP. The scope includes components that are consistent with those in the LRA for which this program is credited. Therefore, the staff finds this acceptable.

The staff noted that the scope of this program includes components and aging effects that would be addressed under GALL AMP XI.M23, "Inspection of Overhead Heavy Load and Light Load Handling Systems," and GALL AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components." However, the applicant does not have AMPs that correspond to GALL AMPs XI.M23 and XI.M38.

During the audit and review, the staff asked the applicant to provide additional information to justify crediting this Periodic Surveillance and Preventive Maintenance (PSPM) AMP instead of implementing AMPs that correspond to GALL AMPs XI.M23 and XI.M38.

In response, the applicant stated that reactor building steel crane structural girders used in load handling are inspected under the PSPM program, while process facility crane rails and girders are inspected under the Structures Monitoring Program. The Structures Monitoring Program will be enhanced, as identified in LRA Section B.1.27, to address crane rails and girders. These programs when enhanced will include visual inspections of the crane rails and girders consistent with GALL AMP XI.M23 to manage loss of material. Therefore the aging management activities for crane rails and girders under the above two programs will be consistent with the attributes described for the program in GALL AMP XI.M23 during the period of extended operation. With regard to GALL AMP XI.M38, the applicant stated that aging management activities for internal steel piping, piping components, and ducting included in the PSPM program include periodic visual inspections, and are consistent with the attributes described for GALL AMP XI.M38.

The staff reviewed Attachment 3 of the applicant's program basis document and verified that the applicant's PSPM program includes inspections of the reactor building crane structural girders that are consistent with the activities in GALL AMP XI.M23. Aging of process facility crane rails and girders will be managed by the applicant's Structures Monitoring Program. The PSPM program includes periodic visual inspections of these components to detect surface degradation. The program includes acceptance criteria, which state that if any significant surface corrosion or wear is detected, corrective

actions will be taken. The staff determined that these activities are consistent with GALL AMP XI.M23, and are acceptable.

In addition, the staff review of program basis document determined that the applicant's PSPM program includes visual inspections of the internal surfaces of steel piping, piping components, ducting, and other components to detect aging degradation, which is consistent with GALL AMP XI.M38 for the components and aging effects for which the AMP is credited. These inspections are performed as part of routine surveillance tests or maintenance, as recommended in the GALL Report. The staff finds the use of the PSPM program in lieu of GALL AMPs XI.M23 and XI.M38 acceptable since it includes equivalent activities to manage the aging effects being addressed.

The staff confirmed that the “scope of program” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff concludes that this program element is acceptable.

(2) Preventive Actions - In LRA Section B.1.22, the applicant stated that inspection and testing activities used to identify component aging effects do not prevent aging effects. However, activities are intended to prevent failures of components that might be caused by aging effects.

The staff reviewed the applicant’s program basis document and noted that Attachment 3 includes a table that identifies the plant surveillance/PM activities included in the program, along with the components inspected or maintained, and the parameters monitored to address aging effects. The table also includes a description of the surveillance or PM activities that would be performed, and the acceptance criteria that would be used to determine if the component’s condition is acceptable.

The staff reviewed this table and determined that the PSPM program includes both preventive actions, as well as condition monitoring activities. The PSPM program includes primarily inspection and testing activities, such as visual or other NDE inspections, along with operability testing of components to monitor the condition of the components and provide an indication that aging degradation is not occurring. These activities are performed as part of routine surveillance testing, and are effective at detecting degradation. The preventive actions include routine maintenance activities, such as cleaning of chiller coils, that may prevent aging degradation from occurring, as well as provide an opportunity to detect any degradation that has occurred. These activities are performed as part of routine maintenance at the plant. The staff determined that these activities will provide for the timely detection of aging degradation and are acceptable.

The staff confirmed that the “preventive actions” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff concludes that this program element is acceptable.

(3) Parameters Monitored or Inspected - In LRA Section B.1.22, the applicant stated that this program provides instructions for monitoring structures, systems, and components to detect degradation. Inspection and testing activities monitor various parameters

including system flow, system pressure, surface condition, loss of material, presence of corrosion products, and signs of cracking.

The staff reviewed the applicant's program basis document and noted that Attachment 3 includes a table that identifies the plant surveillance/PM activities included in the program, along with the components inspected or maintained, and the parameters monitored to address aging effects. The table also includes a description of the surveillance or PM activities that would be performed, and the acceptance criteria that would be used to determine if the component's condition is acceptable.

The staff reviewed this table and determined that the parameters monitored or inspected to manage aging primarily include surface condition to detect loss of material, cracking, fouling, or change in properties. The specific parameter monitored is dependent upon the component being inspected. These parameters are effective indicators of aging degradation for components exposed to air or water environments. In some cases, performance testing of components is performed to confirm acceptable performance. This is also an effective indicator of aging degradation since significant degradation will result in poor performance or a failure to perform. The staff finds that the parameters monitored will provide effective indications of aging degradation for the aging effects being addressed and are acceptable.

The staff confirmed that the "parameters monitored or inspected" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff concludes that this program element is acceptable.

(4) Detection of Aging Effects - In LRA Section B.1.22, the applicant stated that PM activities and periodic surveillances provide for periodic component inspections and testing to detect aging effects. Inspection intervals are established such that they provide timely detection of degradation. Inspection intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations. Each inspection or test occurs at least once every ten years. The extent and schedule of inspections and testing assure detection of component degradation prior to loss of intended functions. Established techniques such as visual inspections are used.

The staff reviewed the applicant's program basis document and noted that Attachment 3 includes a table that identifies the plant surveillance/PM activities included in the program, along with the components inspected or maintained, and the parameters monitored to address aging effects. The table also includes a description of the surveillance or PM activities that would be performed, and the acceptance criteria that would be used to determine if the component's condition is acceptable.

The staff reviewed this table and determined that it includes the activities that will be used for the detection of aging. The inspection activities include visual inspections or other NDE techniques of a representative sample of components to detect loss of material, cracking, or fouling. Visual inspection is a proven technique for the detection of aging degradation, particularly when it is performed during maintenance when components can be disassembled. Performance testing of components is also included

as a condition monitoring technique. This is also an effective indicator of aging degradation since significant degradation will result in poor performance or a failure to perform. The inspections and tests are performed as part of routine plant surveillance testing; therefore, the sample size and frequencies for these activities are in accordance with plant requirements and technical specifications. The staff determined that the inspection and testing frequencies are established based upon component material and environment, as well as operating experience, and will provide timely detection of degradation so that corrective actions can be taken prior to the loss of component intended function. The staff finds that the activities included to detect aging effects will provide timely detection of aging degradation for the aging effects being addressed and are acceptable.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff concludes that this program element is acceptable.

(5) Monitoring and Trending - In LRA Section B.1.22, the applicant stated that PM and surveillance testing activities provide for monitoring and trending of aging degradation. Inspection and testing intervals are established such that they provide for timely detection of component degradation. Inspection and testing intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations.

The staff reviewed the applicant’s program basis document and verified that the program includes monitoring and trending activities that provide for timely detection of aging effects. The monitoring and trending activities include comparison of results to acceptance criteria and to past results to develop predictions of degradation rates. These predictions are used to confirm that loss of component function will not occur prior to the next inspection. These monitoring and trending activities are included as part of the routine plant surveillance testing and PM requirements. Inspection intervals are established based upon component material and environment, as well as industry and plant-specific operating experience and manufacturers' recommendations. The staff finds that the use of predicted degradation rates and appropriate inspection intervals will allow for effective management of aging. The staff finds that the monitoring and trending activities included will provide timely detection of aging degradation for the aging effects being addressed and are acceptable.

The staff confirmed that the “monitoring and trending” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff concludes that this program element is acceptable.

(6) Acceptance Criteria - In LRA Section B.1.22, the applicant stated that periodic surveillance and PM program acceptance criteria are defined in specific inspection and testing procedures. The procedures confirm component integrity by verifying the absence of aging effects or by comparing applicable parameters to limits based on applicable intended functions established by plant design basis.

The staff reviewed the applicant’s program basis document and noted that Attachment 3 includes a table that identifies the plant surveillance/PM procedures included in the program, along with the components inspected or maintained, and the parameters monitored to address aging effects. The table also includes a description of the surveillance or PM activities that will be performed, and the acceptance criteria that will be used to determine if the component’s condition is acceptable.

The staff reviewed this table and determined that it includes an acceptable description of the acceptance criteria that will be used to determine if corrective actions are needed, or if modifications to the inspection intervals are required. For surface inspections, the acceptance criteria will be the absence of any significant indication of degradation. Indications of degradation will require corrective actions be taken. This is an appropriate acceptance criteria for surface inspections, which focus on the detection of degradation, such as loss of material, cracking, or fouling. The acceptance criteria for performance testing are based on acceptable performance limits, which are established in plant operating requirements. This is appropriate for the performance testing of components since the acceptance criteria must be consistent with plant surveillance testing procedures. The staff finds the acceptance criteria appropriate for the aging effects being addressed.

The staff confirmed that the “acceptance criteria” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff concludes that this program element is acceptable.

(10) Operating Experience - LRA Section B.1.22 states that in September 2004 inspection of the battery racks A and B carbon steel framing revealed the racks in good condition with no signs of corrosion. In November 2005, battery rack inspections noted no signs of corrosion; however, paint was touched up in areas where acid residue had degraded the paint on the battery racks. During 2005, refueling platform carbon steel components exhibited no significant corrosion or wear during exercise and inspection of the refuel bridge. An inspection of the reactor building crane in July of 2004 revealed no significant corrosion or wear. Absence of aging effects proves that the program is effective for managing loss of material on the battery racks, the refueling platform components, and the reactor building crane, crane rails, and girders.

Inspections of reactor building doors seals between September 2005 and April 2006 detected one damaged door seal. A CR and a work order were issued to repair or replace the seal. Detection of degradation and prompt corrective action prove that the program is effective for managing aging effects for the door seals.

Augmented flow-accelerated corrosion program inspections in 2004 of HPCI piping susceptible to erosion revealed measured wall thicknesses greater than 87.5 percent of nominal wall thickness. Absence of significant wall loss proves that the program is effective for managing loss of material on the HPCI piping. Augmented flow-accelerated corrosion program inspections in 2002 of RCIC piping susceptible to erosion detected three of the four locations with measured wall thicknesses greater than 87.5 percent of nominal wall thickness. The pipe downstream of 13MOV-27 had a measured wall thickness less than 87.5 percent of nominal wall thickness but was evaluated through

the corrective action process and found acceptable for continued use. Detection of degradation and prompt corrective action prove that the program is effective for managing loss of material on the RCIC piping. Inspections of EDG air intake, air start, and exhaust system components in 2003 and 2005 revealed no significant corrosion, cracking, or fouling. Eddy current inspections of the control room chiller condensers in 1998 (70RWC-2A) and 2000 (70RWC-2B) revealed no loss of material or fouling of the condenser tubes. Absence of aging effects proves that the program is effective for managing aging effects for the control room chiller condensers and EDG components. In 2002, the control room chillers were the focus of an action plan due to Freon leaks and reliability problems caused primarily by lack of maintenance personnel with sufficient knowledge of air conditioning systems and lack of scheduled PM. Corrective actions improved the scope and schedule of PM and provided training on refrigeration and air conditioning systems for maintenance personnel.

Preventive maintenance on control room chiller condenser 70RWC-2A in March 2006 revealed corrosion of the carbon steel condenser head inlet/outlet baffle plate and the inner side of the o-ring groove. A corrective action program work order was issued to install a new condenser head at the next available opportunity. Eddy current testing of control room chiller condenser 70RWC-2A in March 2006 revealed several tubes leaking at the tube sheet. The tubes are a press fit into the tube sheet. Attempts were made to roll the tubes tighter into the tube sheet but leakage was still present in most cases. A corrective action program work order was issued to replace the tubes. In 2000, the security generator failed its operational test by tripping on high temperature. The cause was radiator fouling. Corrective actions flushed the cooling system and revised the PM interval from ten to five years. Confirmation of heat transfer ability and timely corrective actions prove that the program is effective in managing fouling for the security generator radiator. Security generator operational testing in 2005 showed the engine coolant temperature within acceptance criteria after the generator had been running loaded for 20 minutes. These results prove that the program is effective for managing fouling of the security generator radiator.

The staff reviewed the operating experience for the various systems within the scope of the PSPM program to confirm that the aging effects identified are consistent with those in the LRA and with industry operating experience. Also, the staff confirmed that the corrective actions taken are appropriate for the aging effects identified. The staff reviewed work orders a sample of work orders and noted that in November 2005, battery rack inspections noted no signs of corrosion; however, paint was touched up in areas where acid residue had degraded the paint. This operating experience provides evidence that the inspections performed as part of the PSPM program are effective at detecting low-levels of degradation prior to a component loss of intended function occurring. Repairing the protective paint coating was an appropriate corrective action since it prevented further degradation from occurring. The staff also reviewed a condition report and noted that in March 2006, PM on control room chiller condenser 70RWC-2A revealed corrosion of the carbon steel condenser head inlet/outlet baffle plate, along with the inner side of the o-ring groove. The corrective action taken was to install a new condenser head at the next available opportunity. This operating experience provides evidence that the PM activities included in the PSPM program are also effective at detecting aging degradation. The corrective action taken was

> appropriate since the condenser head baffle plate was corroded and was unfit for continued service. The staff determined that these operating experience events provide objective evidence that the PSPM program will provide timely detection of aging degradation and corrective action.
>
> The staff also reviewed plant operating experience reports and confirmed that the plant-specific operating experience did not include any aging effects for systems and components within the scope of this program that are not bounded by industry operating experience.
>
> On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant's PSPM program will adequately manage the aging effects identified in the LRA for which this AMP is credited.

The staff confirmed that the "operating experience" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

Enhancement. In LRA Section B.1.22, the applicant stated an enhancement to their existing program elements for "scope of program," "parameters monitored/inspected," "detection of aging effects," and "acceptance criteria." Specifically, the enhancement states:

> Prior to the period of extended operation, program activity guidance documents will be enhanced as necessary to assure that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The staff confirmed by discussion with the applicant that this enhancement is to update implementing guidance documents, such as plant procedures, and does not alter the technical elements of the PSPM program. The applicant identified this enhancement as Commitment No. 13 (JAFP-06-0109, dated July 31, 2007). The staff considers the updating of guidance documents to be part of program implementation, and not within the scope of the LRA audit.

UFSAR Supplement. In LRA Section A.2.1.24, the applicant provided the UFSAR supplement for the Periodic Surveillance and Preventive Maintenance Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment No. 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the program enhancement is identified as Commitment No. 13, to be implemented before the period of extended operation. The staff reviewed this section and determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Periodic Surveillance and Preventive Maintenance Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by

10 CFR 54.21(d).

3.0.3.3.5 Water Chemistry Control - Auxiliary Systems Program

Summary of Technical Information in the Application. LRA Section B.1.29.1 describes the existing plant-specific Water Chemistry Control - Auxiliary Systems Program.

The Water Chemistry Control - Auxiliary Systems Program manages loss of material for components exposed to treated water. The program samples, analyzes, and replaces coolant for the control room and relay room chilled water system, security generator jacket cooling water, auxiliary boiler heating water, decay heat removal cooling water, and the stator cooling water system to minimize component exposure to harsh environments.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the information included in LRA Section B.1.29.1 regarding the applicant's demonstration of the Water Chemistry Control - Auxiliary Systems Program to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.

During the audit and review, the staff reviewed the Water Chemistry Control - Auxiliary Systems Program against the AMP elements found in the GALL Report, SRP-LR Section A.1.2.3, and SRP-LR Table A.1-1, focusing its review on how the program manages aging effects through the effective incorporation of 10 elements (i.e., "scope of program," "preventive actions," "parameters monitored or inspected," "detection of aging effects," "monitoring and trending," "acceptance criteria," "corrective actions," "confirmation process," "administrative controls," and "operating experience").

The applicant indicated that the "corrective actions," "confirmation process," and "administrative controls" program elements are parts of the site-controlled QA program. The staff's evaluation of the QA program is discussed in SER Section 3.0.4. The remaining seven elements are discussed below.

(1) Scope of the Program - In LRA Section B.1.29.1, the applicant stated that program activities include sampling, analysis, and replacement of coolant for the control room and relay room chilled water system, the security generator jacket cooling water, auxiliary boiler heating water, decay heat removal cooling water, and the stator cooling water to minimize component exposure to aggressive environments.

    The staff reviewed the program basis document and determined that it adequately describes the specific systems and components within the scope of this program for which aging will be managed. The staff reviewed each of these systems and determined that they use treated water as the cooling medium. Since this program manages aging by monitoring and analyzing the coolant, these systems are appropriate for inclusion within the scope of this program.

    The staff confirmed that the "scope of program" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff concludes that this program element is acceptable.

(2) Preventive Actions - In LRA Section B.1.29.1, the applicant stated that this program includes monitoring and control of the control room and relay room chilled water system, the security generator jacket cooling water, auxiliary boiler heating water, decay heat removal cooling water, and the stator cooling water to minimize exposure to aggressive environments.

The staff determined that the program includes monitoring and control of water chemistry to minimize component exposure to aggressive water environments. The aging effects managed by this program are loss of material, fouling, and cracking, which are directly related to the purity and aggressiveness of the water to which the components are exposed. Therefore, monitoring and controlling the water chemistry is an effective means of managing aging for the components within the scope of this program. The staff finds these preventive actions are appropriate to manage the aging effects for which this program is credited.

The staff confirmed that the "preventive actions" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.2. The staff concludes that this program element is acceptable.

(3) Parameters Monitored or Inspected - In LRA Section B.1.29.1, the applicant stated that in accordance with industry recommendations, stator cooling water parameters monitored are conductivity, soluble copper, and dissolved oxygen. In accordance with industry recommendations, auxiliary boiler heating water parameters monitored are conductivity, pH, and dissolved oxygen.

The staff noted that this program is credited to manage loss of material, fouling, and cracking for components exposed to treated water. These aging effects are directly related to the purity and aggressiveness of the water, which are based on the conductivity, pH and dissolved oxygen in the water. Therefore, monitoring these parameters is an effective means of assessing the purity and aggressiveness of the water, and determining whether corrective actions are needed to modify the water chemistry. On this basis, the staff finds these parameters acceptable for this program.

In response to the staff's inquiry on sampling frequency, the applicant stated that stator cooling water conductivity is monitored weekly, while the dissolved oxygen and soluble copper are monitored monthly. JAFNPP has two on-line stator cooling water conductivity monitors. Auxiliary boiler heating water conductivity, pH, and dissolved oxygen are monitored quarterly. The staff determined that these frequencies are consistent with industry practice and are acceptable.

In response to the staff's inquiry on the technical basis for selection of parameters to be monitored, the applicant stated that Water Chemistry Control - Auxiliary Systems AMP is based on equipment vendor specifications, chemical vendor recommendations, technical manuals, industry standards, and operating experience. The staff determined that the applicant's basis for selection of parameters is acceptable since it considers vendor specifications, industry standards, and operating experience.

The staff confirmed that the “parameters monitored or inspected” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.3. The staff concludes that this program element is acceptable.

(4) Detection of Aging Effects - In LRA Section B.1.29.1, the applicant stated that the program manages loss of material for stator cooling water and decay heat removal cooling water system components, loss of material and fouling for control room and relay room chilled water system and the security generator jacket cooling water components, and loss of material and cracking of auxiliary boiler heating water components. The one-time inspection program describes inspections planned to verify the effectiveness of water chemistry control programs to ensure that significant degradation is not occurring and component intended function is maintained during the period of extended operation.

The staff determined that this program includes monitoring and control of water chemistry to manage loss of material, fouling, and cracking of auxiliary system components. These aging effects are directly related to the purity and aggressiveness of the water; therefore, monitoring these parameters will provide an effective means of mitigating aging. The monitoring frequencies will provide for timely detection of adverse water chemistry such that corrective actions can be taken prior to a loss of component intended function. The staff finds these activities appropriate for managing the aging effects for which this program is credited since they will provide reasonable assurance that the component intended function will be maintained for the period of extended operation.

The staff confirmed that the “detection of aging effects” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.4. The staff concludes that this program element is acceptable.

(5) Monitoring and Trending - In LRA Section B.1.29.1, the applicant stated that values from analyses are archived for long-term trending and review.

During the audit and review, the staff asked the applicant for additional information on the parameters that are to be trended, along with the administrative controls to be used in implementing a periodic review and determining whether corrective actions are required.

In response, the applicant stated that the parameters monitored are archived for long term trending and review. Selection of parameters is as described previously in the discussion of program element (3) “parameters monitored or inspected.” The applicant further stated that, in accordance with Entergy corporate procedure EN-CY-101, “Chemistry Activities,” Revision 0, the chemistry department trends chemistry and radiochemistry parameters to allow identification and correction of adverse trends before limits are exceeded. Data is reviewed as it is generated and adverse data indications are evaluated. The JAFNPP site chemistry staff reviews the data trends to ensure adverse trends are noted and addressed in a timely manner. Quarterly group data review sessions are performed by the site chemistry department to share information on specific plant chemistry. A corporate chemist periodically participates in the data review

sessions to provide an independent assessment.

The staff reviewed the applicant's procedure and determined that appropriate administrative controls and program activities are in place to monitor and trend chemistry parameters to identify aging effects and take corrective actions prior to the loss of a component intended function. The staff finds that the applicant's use of site chemistry staff reviews and quarterly group data review sessions is an effective means of monitoring water chemistry parameters.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff concludes that this program element is acceptable.

(6) Acceptance Criteria - In LRA Section B.1.29.1, the applicant stated in accordance with industry recommendations, acceptance criteria for the stator cooling water system are as follows.

conductivity	< 0.5 μS/cm
dissolved oxygen	> 2000 ppb, < 8000 ppb

In accordance with industry recommendations, acceptance criteria for the auxiliary boiler heating water are as follows:

conductivity	< 30 μmhos/cm
pH	> 5.5, < 10.5

During the audit and review, the staff asked the applicant for additional information on the acceptance criteria for other auxiliary systems.

In response, the applicant stated that acceptance criteria for the Water Chemistry Control - Auxiliary Systems AMP are based on equipment vendor specifications, chemical vendor recommendations, technical manuals, industry standards, and operating experience.

The staff reviewed the applicant's water chemistry acceptance criteria and determined that the criteria for the stator cooling water system and auxiliary boiler heating water are consistent with acceptance criteria used in the industry. The staff also determined that, for the other auxiliary systems, the use of vendor recommendations, technical manuals, industry standards, and operating experience is an acceptable basis for developing water chemistry acceptance criteria, against which the need for corrective actions can be evaluated, since it will provide criteria that are consistent with those currently used in the industry and are proven to be effective in managing aging of these components.

The staff confirmed that the "acceptance criteria" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.6. The staff concludes that this program element is acceptable.

(10) Operating Experience - LRA Section B.1.29.1 states that stator cooling water conductivity, dissolved oxygen, and copper content sample results from 2000 through 2004 revealed only one instance of a parameter outside acceptance criteria. An elevated copper reading in September 2000 was determined to be due to rinsing of the filtration rig with nitric acid. The rig had brass fittings that leeched copper into the sample. After the brass fittings had been replaced with stainless steel fittings and rinsing of the rig done with demineralized water, sample results were within acceptance criteria. Continuous confirmation of stator cooling water quality proves that the program is effective in managing loss of material for stator cooling water system components.

Hot water boiler conductivity and pH sample results from 2000 through 2004 revealed no parameter outside the acceptance criteria. Continuous confirmation of hot water boiler water quality proves that the program is effective in managing loss of material for auxiliary boiler heating water system components.

During the audit and review, the staff asked the applicant for additional information on operating experience for other auxiliary systems.

In response, the applicant stated that the control room and relay room chilled water, decay heat removal cooling water, and security generator jacket cooling water systems are not currently monitored; therefore, operating experience providing objective evidence of program effectiveness does not exist. Industry recommendations and One-Time Inspection Program results will be considered in determining the parameters to be monitored, monitoring frequency, and associated acceptance criteria.

The staff reviewed plant operating experience review reports and condition reports and verified that there were no aging effects identified that are not bounded by industry operating experience. The staff noted that operating experience discussed in the LRA includes an instance in which elevated levels of copper were detected, indicating a loss of material in the stator cooling water system. The cause was determined to be the use of nitric acid as a rinsing agent in the system, which contacted brass fittings used in the system resulting in the release of copper from the fittings. Appropriate corrective actions were taken to resolve the problem by changing the fitting material and the rinsing agent.

On the basis of its review of the operating experience and discussions with the applicant's technical staff, the staff concludes that the applicant’s Water Chemistry Control-Auxiliary Systems program will adequately manage the aging effects that are identified in the LRA for which this AMP is credited.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10. The staff finds this program element acceptable.

The staff noted that LRA Section B.1.29.1 states one enhancement to the applicant’s existing Water Chemistry Control-Auxiliary Systems program. However, in program basis document, the applicant states three enhancements. In its response, the applicant stated that it will correct the LRA to reflect the three enhancements. In its letter dated February 1, 2007, the applicant revised LRA Section B.1.29.1 to add these

enhancements.

Enhancement 1. In the program basis document, JAF-RPT-05-LRD02, Section 4.22.1, Revision 4, the applicant stated an enhancement to their existing program element for "scope of program." The enhancement states the following:

Guidance for sampling and analysis of coolant for the control room and relay room chilled water, decay heat removal cooling water, and the security generator jacket cooling water will be added to the Water Chemistry Control - Auxiliary Systems Program procedures. Industry recommendations and One-Time Inspection Program results will be considered in determining the parameters to be sampled and the analytical techniques to be used.

The staff determined that, since this is a plant-specific program, this enhancement is not to meet the recommendations in the GALL Report. As such, the staff reviewed this enhancement as it relates to the ability of this program to adequately manage the aging effects for which it is credited. The staff determined that this enhancement to the "scope of program" element will add the control room and relay room chilled water, decay heat removal cooling water, and the security generator jacket cooling water systems to the scope of the existing Water Chemistry Control - Auxiliary Systems Program. The staff reviewed these systems and determined that they use treated water similar to the other systems currently within the scope of this program as the cooling medium; therefore, including them within the scope of this program is appropriate. The staff finds that including guidance in the program procedures is necessary to ensure that the program is properly implemented. On this basis, the staff finds this enhancement acceptable. The applicant identified this enhancement as Commitment No. 18 (JAFP-06-0109, dated July 31, 2007).

Enhancement 2. In the program basis document, the applicant stated an enhancement to their existing program element for "parameters monitored/inspected." The enhancement stated the following:

> Guidance for monitoring to control the concentration of corrosive impurities (such as chlorides, sulfates, and dissolved oxygen) to mitigate degradation of structural materials will be developed for control room and relay room chilled water, decay heat removal cooling water, and the security generator jacket cooling water and will be added to the Water Chemistry Control - Auxiliary Systems Program procedures. Industry recommendations and One-Time Inspection Program results will be considered in determining the parameters to be sampled and the analytical techniques to be used.

The staff determined that, since this is a plant-specific program, the enhancement is not to meet the recommendations in the GALL Report. As such, the staff reviewed this enhancement as it relates to the ability of this program to adequately manage the aging effects for which it is credited. The staff determined that this enhancement to the "parameters monitored/inspected" program element will develop guidance on which parameters to monitor for the control room and relay room chilled water, decay heat

removal cooling water, and the security generator jacket cooling water systems. This guidance will then be added to the program implementing procedures.

In response to the staff's inquiry on the technical basis for selection of parameters to be monitored, the applicant stated that Water Chemistry Control - Auxiliary Systems AMP is based on equipment vendor specifications, chemical vendor recommendations, technical manuals, industry standards, and operating experience. The staff determined that the applicant's basis for selection of parameters is acceptable since it considers information from appropriate sources that will provide reasonable assurance that acceptable parameters will be selected. The staff finds that including guidance in the program procedures is necessary to ensure that the program is properly implemented. On this basis, the staff finds this enhancement acceptable. The applicant identified this enhancement as Commitment No. 18.

Enhancement 3. In the program basis document, the applicant stated an enhancement to their existing program element for "acceptance criteria." The enhancement stated the following:

> Industry standards such as EPRI guidelines along with manufacturer's recommendations will be used to establish the appropriate acceptance criteria for control room and relay room chilled water, decay heat removal cooling water, and the security generator jacket cooling water and will be added to the Water Chemistry Control - Auxiliary Systems Program procedures.

The staff determined that, since this is a plant-specific program, the enhancement is not to meet the recommendations in the GALL Report. As such, the staff reviewed this enhancement as it relates to the ability of this program to adequately manage the aging effects for which it is credited. The staff determined that this enhancement to the "acceptance criteria" program element will develop acceptance criteria for the control room and relay room chilled water, decay heat removal cooling water, and the security generator jacket cooling water systems. The acceptance criteria will be based on industry standards, such as EPRI guidelines and manufacturer's recommendations. The staff determined that the applicant's basis for selection of acceptance criteria is acceptable since it considers information from appropriate sources that will provide reasonable assurance that appropriate acceptance criteria will be selected. The staff finds that including guidance in the program procedures is necessary to ensure that the program is properly implemented. On this basis, the staff finds this enhancement acceptable. The applicant identified this enhancement as Commitment No. 18.

UFSAR Supplement. In LRA Section A.2.1.32, the applicant provided the UFSAR supplement for the Water Chemistry Control - Auxiliary Systems Program. The staff reviewed the applicant's license renewal commitment list in LRA Amendment No. 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that the program enhancements are identified as Commitment No. 18, to be implemented before the period of extended operation. The staff reviewed this section and determined that the information in the UFSAR supplement provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

Conclusion. On the basis of its technical review of the applicant's Water Chemistry Control - Auxiliary Systems Program, the staff concludes that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.3.3.6 Bolted Cable Connections Program

During the staff's audit, the staff asked the applicant a question regarding its lack of the Bolted Cable Connections Program. In its letter dated February 1, 2007, the applicant amended the LRA. The applicant submitted LRA Section B.1.31, "Bolted Cable Connections Program, " and stated that its Bolted Cable Connections Program is a plant-specific AMP and this AMP has been developed as an alternate to GALL AMP XI.E6. This program will be implemented prior to the period of extended operation (Commitment No. 24 -JAFP-06-0109, dated February 1, 2007).

Summary of Technical Information in the Application. Cable connections are used to connect cable conductors to other cables or electrical devices. Connections associated with cables within the scope of license renewal are considered for this program. The most common types of connections used in nuclear power plants are splices (butt or bolted), crimp-type ring lugs, connectors, and terminal blocks. Most connections involve insulating material and metallic parts. This program for electrical cable connections (metallic parts) accounts for loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. This program does not apply to the high-voltage switchyard connections.

GALL AMP XI.E4, "Metal Enclosed Bus," manages the aging effects for the connections associated with metal enclosed bus. GALL AMP XI.E4 manages the aging effects from thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation on the metallic parts of metal enclosed bus (MEB) connections. Therefore, MEB connections are not included in this program.

Circuits exposed to appreciable ohmic or ambient heating during operation may experience loosening related to repeated cycling of connected loads or cycling of the ambient temperature environment. Bolted connectors, splices, and terminal blocks may loosen if subjected to significant thermally induced stress and cycling. The design of these connections will account for the stresses associated with ohmic heating, thermal cycling, and dissimilar metal connections. Therefore, these stressors/mechanisms should not be a significant aging issue. However, confirmation of the lack of aging effects will be required.

This sampling program provides for one-time inspections that will be completed prior to the period of extended operation. The factors considered for sample selection are application (medium and low voltage), circuit loading (high loading), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selection will be documented. If an unacceptable condition or situation is identified in the selected sample, the corrective action program will be used to evaluate the condition and determine appropriate corrective action.

None of the connections in this program are subject to the environmental qualification requirements of 10 CFR 50.49. This plant-specific AMP has been developed as an alternate to GALL AMP XI.E6, to provide additional assurance that electrical cable connections will perform their intended function for the period of extended operation.

Staff Evaluation. In accordance with 10 CFR 54.21(a)(3), the staff reviewed the revision to LRA Section B.1.31, “Bolted Cable Connections Program," information included in LRA Amendment 5, Attachment 2, dated February 1, 2007, to ensure that the effects of aging, as discussed above, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The audit team reviewed the applicant’s AMP against the AMP elements found in the SRP-LR, Appendix A.1, Section A.1.2.3 and SRP-LR Table.1-1. The staff's review of each AMP elements is discussed as follows:

(1) Scope of Program - The “scope of program” program element criterion in SRP-LR Appendix A.1.2.3.1 requires that the program scope include the specific structures and components addressed with this program.

    The applicant states in LRA Section B.1.34, for the “scope of program” program element, that this program applies to Non-EQ connections associated with cables within the scope of license renewal. This program does not include the high-voltage (>35 kV) switchyard connections. The connections within the scope of the license renewal are evaluated for applicability of this program. The criteria for including connections in the program are that the connection is a bolted connection and is not covered under the EQ program or an existing PM program.

    The staff determined that the specific commodity groups for which the program manages aging effects are identified (Non-EQ bolted cable connections associated with cables within the scope of license renewal), which satisfies the criterion defined in SRP-LR Appendix A.1.2.3.1. The staff also determined that the exclusion of high-voltage (>35 kV) switchyard connections, connections covered under EQ program and the existing PM program, acceptable. Switchyard connections are addressed in SER Section 3.6.2.2. EQ cable connections are cover under 10 CFR 50.49. Cable connections under PM program are periodically inspected. On this basis, the staff finds that the applicant’s scope of program acceptable.

    The staff confirmed that the “scope of program” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.1. The staff concludes that this program element is acceptable.

(2) Preventive Actions - The “preventive actions” program element criterion in SRP-LR Appendix A.1.2.3.2 is that condition monitoring programs do not rely on preventive actions, and thus, preventive actions need not be provided.

    The applicant states in LRA Section B.1.33, for the “preventive actions” program element, that this one-time inspection program is a condition monitoring program; therefore, no actions are taken as part of this program to prevent or mitigate aging degradation.

The staff determined that the preventive actions program element satisfies the criterion defined in SRP-LR Appendix B.1.2.3.2. The staff finds it acceptable because this is a condition monitoring program and there is no need for preventive actions. On this basis, the staff finds the applicant's preventive actions acceptable.

(3) Parameter Monitored/Inspected - The "parameter monitored or inspected" program element criterion in SRP-LR Appendix A.1.2.3.3 are:

> The parameter to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s). The parameter monitored or inspected should detect the presence and extent of aging effects.

The applicant states in LRA Section B.1.34, for the "parameters monitored/inspected" program element, that this program will focus on the metallic parts of the cable connections. The one-time inspection verifies that the loosening of bolted connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation is not an issue that requires a periodic AMP.

The staff determined that the parameters monitored/inspected program element satisfies the criterion defined in SRP-LR Appendix A.1.2.3.3. Loosening (or high resistance) of bolted cable connections are the potential aging effects due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation. The design of bolted cable connections usually account for the above stressors. The one-time inspection is to confirm that these stressors are not an issue that requires a periodic AMP. On this basis, the staff finds that the applicant's parameters monitored or inspected acceptable.

(4) Detection of Aging Effects - The "detection of aging effects" program element criteria in SRP-LR Appendix A.1.2.3.4 are:

> Provide information that links the parameters to be monitored or inspected to the aging effects being managed.
>
> Describe when, where, and how program data are collected (i.e., all aspects of activities to collect data as part of the program)
>
> Link the method for the inspection population and sample size when sampling is used to inspect a group of SCs. The inspection population should be based on such aspects of the SCs as a similarity of materials of construction, fabrication, procurement, design, installation, operating environment, or aging effects.

The applicant states in LRA Section B.1.34, the "detection of aging effects" program element, that a representative sample of electrical connections within the scope of license renewal are subject to AMR and will be inspected or tested prior to the period of extended operation to verify there are no aging effects requiring management during the period of extended operation. The factors considered for sample selection will be

application (medium and low voltage), circuit loading (high load), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected is to be documented. Inspection methods may include thermography, contact resistance testing, or other appropriate methods including visual based on plant configuration and industry guidance. The one-time inspection provides additional confirmation to support operating experience that shows electrical connection have not experienced a high degree of failures, and that existing installation and maintenance practices are effective.

The staff determined that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.4. Thermography is used to detect aging effects of bolted cable connections due to thermal cycling, ohmic heating, electrical transients, and vibration. Contact resistance measurement is an appropriate inspection technique to detect high resistance of bolted cable connections due to chemical contamination, corrosion, and oxidation. Visual inspection is an alternative technique to thermography or measuring connection resistance of bolted connections that are covered with heat shrink tape, sleeving, insulating boots, etc.,. The staff also determined that the proposed one-time inspection is acceptable because the design of these connections will account for the stresses associated with the above aging effects and one-time inspection is to confirm that these stressors/mechanisms should not be a significant aging issue. On this basis, the staff finds the applicant's detection of aging effects acceptable.

(5) Monitoring and Trending - The "monitoring and trending" program element criteria in SRP-LR Appendix A Section A.1.2.3.5 are:

> Monitoring and trending activities should be described, and they should provide predictability of the extend of degradation and thus effect timely corrective or mitigative actions.
>
> This program element should describe how the data collected are evaluated and may also include trending for a forward look. The parameter or indicator trended should be described.

The applicant states in LRA Section B.1.34, for the "monitoring and trending" program element, that in this program, trending actions are not included as part of this program because this is a one-time inspection.

The staff determined that absence of trending for testing is acceptable since the test is a one-time inspection and the ability to trend inspection results is limited by the available data. Furthermore, the staff did not see a need for such activities. On this basis, the staff finds the applicant's monitoring and trending acceptable.

The staff confirmed that the "monitoring and trending" program element satisfies the criterion defined in SRP-LR Section A.1.2.3.5. The staff concludes that this program element is acceptable.

(6) Acceptance Criteria - The "acceptance criteria" program element criteria in SRP-LR Appendix A.1.2.3.6 are:

The acceptance criteria of the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the SC intended function(s) are maintained under all CLB design conditions during the period of extended operation.

The program should include a methodology for analyzing the results against applicable acceptance criteria.

Qualitative inspections should be performed to same predetermined criteria as quantitative inspections by personnel in accordance with ASME Code and through approved site-specific programs.

The applicant states in LRA Section B.1.34, for the "acceptance criteria" program element, that the acceptance criteria for each inspection/surveillance are defined by the specific type of inspection or test performed for the specific type of cable connections. Acceptance criteria ensure that the intended functions of the cable connections can be maintained consistent with the CLB.

The staff determined that this program element satisfies the criteria defined in SRP-LR Appendix A.1.2.3.6. The staff finds it acceptable on the basis that acceptance criteria for inspection/surveillance are defined by the specific type of inspection or test performed for the specific type of connection. The applicant will follow current industry standards which, when implemented, will ensure that the license renewal intended functions of the cable connections will be maintained consistent with the current licensing basis.

(7) Corrective Action - The adequacy of the applicant's 10 CFR 50, Appendix B program associated with this program element is addressed in SER Section 3.04.

The staff reviewed the other aspect of this program element to determine whether or not it satisfies the criteria defined in SRP-LR Appendix A.1.2.3.7. The staff found the requirements of 10 CFR Part 50, Appendix B, acceptable to address corrective action. On this basis, the staff finds the applicant's corrective action acceptable.

(8) Confirmation Process - The adequacy of the applicant's 10 CFR 50, Appendix B Program associated with this program element is addressed in SER Section 3.04.

The staff reviewed the other aspect of this program to determine whether or not it satisfies the criteria defined in SRP-LR Appendix A.1.2.3.8.The staff found the requirements of 10 CFR Part 50, Appendix B, acceptable to address administrative controls. On this basis, the staff finds the applicant's confirmation process acceptable.

(9) Administrative Controls - The adequacy of the applicant's 10 CFR Part 50, Appendix B Program associated with this program element is addressed in SER Section 3.04.

The staff reviewed the other aspect of this program element to determine whether or not it satisfies the criteria defined in SRP-LR Appendix A.1.2.3.9. The staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address administrative controls.

(10) Operating Experience - The “operating experience” program element criterion in SRP-LR Appendix A.1.2.3.10 that operating experience should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

The applicant states, in the JAFNPP supplemental LRA, for “operating experience” program element, that operating experience has shown that loosening of connections and corrosion of connections could be a problem without proper installation and maintenance activities. Industry operating experience supports performing this one-time inspection program in lieu of a periodic testing program. This one-time inspection program will verify that the installation and maintenance activities are effective. The Bolted Cable Connections Program is a new program. Plant and industry operating experience was considered when this program was developed. Industry operating experience that forms the basis for the program is described in the operating experience element of the GALL AMP XI.E6 program description. JAFNPP-specific operating is consistent with the operating experience in the GALL AMP XI.E6 program description.

In search of operating experience to respond to NEI’s concerns about the lack of operating experience to support GALL AMP XI.E6 (NEI’s White Paper on GALL AMP XI.E6, dated September 5, 2006), the staff confirmed that very few operating experiences related to failed connections due to aging have been identified and these operating experiences can not support a periodic inspection as currently recommended in GALL AMP XI.E6. The staff finds that the proposed one-time inspection program will ensure that either aging of metallic cable connections is not occurring or existing PM program is effective such that a periodic inspection program is not required.

The staff confirmed that the “operating experience” program element satisfies the criterion defined in SRP-LR Section A.1.2.3.10 and found this program element acceptable.

UFSAR Supplement. The applicant provides its UFSAR Supplement for the Bolted Cable Connections Program in the supplemental LRA, Appendix A.2.1.36, which states that the Bolted Cable Connections Program will focus on the metallic parts of the cable connections.

The staff reviewed the applicant’s license renewal commitment list in LRA Amendment No. 5, Attachment 1, Revision 1, dated February 1, 2007, and confirmed that this new program is identified as Commitment No. 24 (JAFP-06-0109, dated February 1, 2007), to be implemented before the period of extended operation. The staff reviewed this section and determined that the information in the UFSAR supplement provides 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 Bolted Cable Connections Program, the staff concludes that the applicant will have a program that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the UFSAR supplement for this AMP and concludes that, with the addition of Commitment No. 9, it provides an adequate summary description of the program, as required by 10 CFR 54.21(d).

3.0.4 QA Program Attributes Integral to Aging Management Programs

Pursuant to 10 CFR 54.21(a)(3), the applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation. SRP-LR, Branch Technical Position (BTP) RLSB-1, "Aging Management Review – Generic," describes ten elements of an acceptable AMP. Elements (7), (8), and (9) are associated with the QA activities of "corrective actions," "confirmation process," and "administrative controls." BTP RLSB-1 Table A.1-1, "Elements of an Aging Management Program for License Renewal," provides the following description of these program elements:

(7) Corrective Actions – Corrective actions, including root cause determination and prevention of recurrence, should be timely.

(8) Confirmation Process – The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions 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 UFSAR supplement in accordance with 10 CFR 54.21(d).

3.0.4.1 Summary of Technical Information in the Application

In LRA Sections A.2.1, "Aging Management Programs and Activities," and B.0.3, "Corrective Actions, Confirmation Process and Administrative Controls," the applicant described the

elements of corrective action, confirmation process, and administrative controls that are applied to the AMPs for both safety-related and nonsafety-related components. A single QA Program is used which includes the elements of corrective action, confirmation process, and administrative controls. Corrective actions, confirmation, and administrative controls are applied in accordance with the Corrective Action Program regardless of the safety classification of the components. Specifically, in LRA Sections A.2.1 and B.0.3, respectively, the applicant stated that the QA Program implements the requirements of 10 CFR 50, Appendix B, and is consistent with SRP-LR.

LRA Section B.1, "Aging Management Review Results," provided an AMR summary for each unique component type or commodity group determined to require aging management during the period of extended operation.

3.0.4.2 Staff Evaluation

Pursuant to 10 CFR 54.21(a)(3), an applicant is required to demonstrate that the effects of aging on SCs subject to an AMR will be adequately managed so that their intended functions will be maintained consistent with the CLB for the period of extended operation. SRP-LR, Branch Technical Position RLSB-1, "Aging Management Review - Generic," describes ten attributes of an acceptable AMP. Three of these ten attributes are associated with the QA activities of corrective action, confirmation process, and administrative control. BTP RLSB-1, Table A.1-1, "Elements of an Aging Management Program for license Renewal," provides the following description of these quality attributes:

- Corrective actions, including root cause determination and prevention of recurrence, should be timely
- The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective
- Administrative controls should provide a formal review and approval process

SRP-LR, BTP IQMB-1 noted that those aspects of the AMP that affect 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's existing 10 CFR Part 50, Appendix B QA program may be used to address the elements of corrective action, confirmation process, and administrative control. BTP IQMB-1 provides the following guidance with regard to the QA attributes of AMPs:

> Safety-related SCs are subject to Appendix B to 10 CFR Part 50 requirements which are adequate to address all quality related aspects of an AMP consistent with the CLB of the facility for the period of extended operation. For nonsafety-related SCs that are subject to an AMR for license renewal, an applicant has an option to expand the scope of its Appendix B to 10 CFR Part 50 program to include these SCs to address corrective action, confirmation process, and administrative control for aging management during the period of extended operation. In this case, the applicant should document such a commitment in the Final Safety Analysis Report supplement in accordance with 10 CFR 54.21(d).

The NRC staff reviewed the applicant's AMP described in LRA Appendix A, "Updated Safety Analysis Report Supplement," and Appendix B, "Aging Management Programs and Activities," and the license renewal documents. The purpose of this review was to ensure that the quality assurance attributes (corrective action, confirmation process, and administrative controls) were consistent with the staff's guidance described in SRP-LR Section A.2, "Quality Assurance for Aging Management Programs (Branch Technical Position IQMB-1)."

Based on the NRC staff's evaluation, the descriptions of the AMPs and their associated quality attributes provided in LRA Sections A.2.1 and B.0.3 are consistent with the staff's position regarding quality assurance for aging management. However, the applicant has not sufficiently described the use of the quality assurance program and its associated attributes (corrective action, confirmation process, and administrative controls). Specifically, the applicant did not identify those AMPs which do not credit the JAFNPP 10 CFR Part 50, Appendix B, Quality Assurance Program, for the corrective action, confirmation process, and administrative control attributes, or provide a description of the process used in lieu of the JAFNPP QA Program.

In RAI 3.0-1 dated November 22, 2006, the staff requested that the applicant supplement the LRA to clarify that the same corrective action program will be applied to all AMPs and that this program meets the requirements of 10 CFR Part 50, Appendix B and to provide a supplement to the description in LRA Section A.2.1, to clearly indicate the application of the JAFNPP 10 CFR Part 50, Appendix B, QA Program, or an alternative for the corrective action, confirmation process, and administrative control attributes in each program.

In its response dated December 21, 2006, the applicant further described the application of the JAFNPP 10 CFR Part 50, Appendix B, QA Program for corrective action, confirmation process, and administrative controls, and provided a revision to the UFSAR supplement. The revision stated, in part:

> The corrective action controls of the Entergy (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities that are required during the period of extended operation.

The staff reviewed the proposed revision to UFSAR Appendix A, and on the basis of providing this description which clarifies that the same corrective action program will be applied to all AMPs and that this program meets the requirements of 10 CFR Part 50, Appendix B, the staff finds the applicant's response to RAI 3.0-1 acceptable. Therefore, the staff's concern described in RAI 3.0-1 is resolved.

3.0.4.3 Conclusion

On the basis of the staff's evaluation, the descriptions and applicability of the plant-specific AMPs and their associated quality attributes provided in LRA Section A.2.1, LRA Sections B.0.3 and B.1, and the RAI response, are consistent with the staff's position regarding QA for aging management. The staff concludes that the QA attributes (corrective action, confirmation process, and administrative control) of the applicant's AMPs are consistent with 10 CFR 54.21(a)(3).

3.1 <u>Aging Management of Reactor Vessel, Internals, and Reactor Coolant System</u>

This section of the SER documents the staff's review of the applicant's AMR results for the RV, internals, and reactor coolant system (RCS) components and component groups of the following:

- reactor vessel
- reactor vessel internals
- reactor coolant pressure boundary

3.1.1 Summary of Technical Information in the Application

In LRA Section 3.1, the applicant provided AMR results for the RV, internals, and RCS components and component groups. In LRA Table 3.1.1, "Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the RV, internals, and RCS components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.1.2 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 RV, internals, and RCS components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are summarized in SER Section 3.1.2.1.

In the onsite audit, the staff also selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.1.2.2. The staff's audit evaluations are summarized in SER Section 3.1.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and whether the aging

effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are summarized in SER Section 3.1.2.3. The staff's evaluation of the technical review is also documented in SER Section 3.1.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the RV, internals, and RCS components.

Table 3.1-1, provided below, includes a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.1, that are addressed in the GALL Report.

Table 3.1-1 Staff Evaluation for Reactor Vessel, Internals, and Reactor Coolant System Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel pressure vessel support skirt and attachment welds (3.1.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-2)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.1)
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor coolant pressure boundary piping, piping components, and piping elements exposed to reactor coolant (3.1.1-3)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel pump and valve closure bolting (3.1.1-4)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) check Code limits for allowable cycles (less than 7000 cycles) of thermal stress range	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.1)
Stainless steel and nickel alloy reactor vessel internals components (3.1.1-5)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.1)
Nickel Alloy tubes and sleeves in a reactor coolant and secondary feedwater/steam environment (3.1.1-6)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.1)
Steel and stainless steel reactor coolant pressure boundary closure bolting, head closure studs, support skirts and attachment welds, pressurizer relief tank components, steam generator components, piping and components external surfaces and bolting (3.1.1-7)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel; stainless steel; and nickel-alloy reactor coolant pressure boundary piping, piping components, piping elements; flanges; nozzles and safe ends; pressurizer vessel shell heads and welds; heater sheaths and sleeves; penetrations; and thermal sleeves (3.1.1-8)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Not Applicable	Not applicable to BWRs
Steel; stainless steel; steel with nickel-alloy or stainless steel cladding; nickel-alloy reactor vessel components: flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds (3.1.1-9)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c) and environmental effects are to be addressed for Class 1 components	Not Applicable	Not applicable to BWRs (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	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.2, Item 1)
Steel steam generator shell assembly exposed to secondary feedwater and steam (3.1.1-12)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.2, Item 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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Not applicable for isolation condenser components since JAFNPP does not have an isolation condenser. Consistent with GALL Report, which recommends further evaluation, for other components crediting this AMR (See SER Section 3.1.2.2.2, Item 2)
Stainless steel, nickel-alloy, and steel with nickel-alloy or stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds (3.1.1-14)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.2, Item 3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant (3.1.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.2, Item 3)
Steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam (3.1.1-16)	Loss of material due to general, pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry and, for Westinghouse Model 44 and 51 S/G, if general and pitting corrosion of the shell is known to exist, additional inspection procedures are to be developed.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.2, Item 4)
Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds (3.1.1-17)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations.	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.3, Item 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	Reactor Vessel Surveillance (B.1.24)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.3, Item 2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and nickel alloy top head enclosure vessel flange leak detection line (3.1.1-19)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.4, Item 1)
Stainless steel isolation condenser components exposed to reactor coolant (3.1.1-20)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and plant-specific verification program	Not Applicable	Not applicable (See SER Section 3.1.2.2.4, Item 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	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.5)
Stainless steel and nickel alloy reactor vessel internals components exposed to reactor coolant and neutron flux (3.1.1-22)	Loss of fracture toughness due to neutron irradiation embrittlement, void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.6)
Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (3.1.1-23)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Class 1 cast austenitic stainless steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-24)	Cracking due to stress corrosion cracking	Water Chemistry and, for CASS components that do not meet the NUREG-0313 guidelines, a plant-specific aging management program	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.7)
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.	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.8, Item 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	Not Applicable	Not applicable (See SER Section 3.1.2.2.8, Item 2)
Stainless steel and nickel alloy reactor vessel internals screws, bolts, tie rods, and hold-down springs (3.1.1-27)	Loss of preload due to stress relaxation	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.9)
Steel steam generator feedwater impingement plate and support exposed to secondary feedwater (3.1.1-28)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.10)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
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.	BWR Vessel Internals (B.1.7), with GE SIL-644, R1 recommendations as included in BWRVIP-139	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.1.2.2.11)
Stainless steel reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Baffle/former assembly, Lower internal assembly, shroud assemblies, Plenum cover and plenum cylinder, Upper grid assembly, Control rod guide tube (CRGT) assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly, Thermal shield, Instrumentation support structures) (3.1.1-30)	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and 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.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.12)
Nickel alloy and steel with nickel-alloy cladding piping, piping component, piping elements, penetrations, nozzles, safe ends, and welds (other than reactor vessel head); pressurizer heater sheaths, sleeves, diaphragm plate, manways and flanges; core support pads/core guide lugs (3.1.1-31)	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and FSAR supp commitment to implement applicable plant commitments to (1) NRC Orders, Bulletins, and Generic Letters associated with nickel alloys and (2) staff-accepted industry guidelines.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.13)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel steam generator feedwater inlet ring and supports (3.1.1-32)	Wall thinning due to flow-accelerated corrosion	A plant-specific aging management program is to be evaluated.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.14)
Stainless steel and nickel alloy reactor vessel internals components (3.1.1-33)	Changes in dimensions due to void swelling	FSAR supplement commitment to (1) participate in industry RVI aging programs (2) implement applicable results (3) submit for NRC approval > 24 months before the extended period an RVI inspection plan based on industry recommendation.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.15)
Stainless steel and nickel alloy reactor control rod drive head penetration pressure housings (3.1.1-34)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.16)
Steel with stainless steel or nickel alloy cladding primary side components; steam generator upper and lower heads, tubesheets and tube-to-tube sheet welds (3.1.1-35)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and for nickel alloy, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.16)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy, stainless steel pressurizer spray head (3.1.1-36)	Cracking due to stress corrosion cracking and primary water stress corrosion cracking	Water Chemistry and One-Time Inspection and, for nickel alloy welded spray heads, comply with applicable NRC Orders and provide a commitment in the FSAR supplement to implement applicable (1) Bulletins and Generic Letters and (2) staff-accepted industry guidelines.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.16)
Stainless steel and nickel alloy reactor vessel internals components (e.g., Upper internals assembly, RCCA guide tube assemblies, Lower internal assembly, CEA shroud assemblies, Core shroud assembly, Core support shield assembly, Core barrel assembly, Lower grid assembly, Flow distributor assembly) (3.1.1-37)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking, irradiation-assisted stress corrosion cracking	Water Chemistry and 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.	Not Applicable	Not applicable to BWRs (See SER Section 3.1.2.2.17)
Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant (3.1.1-38)	Cracking due to cyclic loading	BWR CR Drive Return Line Nozzle	BWR CRD Return Line Nozzle (B.1.2) and Water Chemistry Control-BWR (B.1.29.2) (as a supplement)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant (3.1.1-39)	Cracking due to cyclic loading	BWR Feedwater Nozzle	BWR Feedwater Nozzle (B.1.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and nickel alloy penetrations for control rod drive stub tubes instrumentation, jet pump instrumentation, standby liquid control, flux monitor, and drain line exposed to reactor coolant (3.1.1-40)	Cracking due to stress corrosion cracking, Intergranular stress corrosion cracking, cyclic loading	BWR Penetrations and Water Chemistry	Water Chemistry Control-BWR (B.1.29.2) and either the BWR Penetration (B.1.4), BWR Vessel Internals (B.1.7) or Inservice Inspection (B.1.16.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.1)
Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds (3.1.1-41)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	Water Chemistry Control-BWR (B.1.29.2) and either the BWR Stress Corrosion Cracking (B.1.5), BWR Feedwater Nozzle (B.1.3), BWR Vessel Internals (B.1.7) or One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.2)
Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant (3.1.1-42)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel ID Attachment Welds and Water Chemistry	BWR Vessel ID Attachment Welds (B.1.6) and Water Chemistry Control-BWR (B.1.29.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant (3.1.1-43)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Vessel Internals and Water Chemistry	BWR Vessel Internals (B.1.7) and Water Chemistry Control-BWR (B.1.29.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and nickel alloy core shroud, core plate, core plate bolts, support structure, top guide, core spray lines, spargers, jet pump assemblies, control rod drive housing, nuclear instrumentation guide tubes (3.1.1-44)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	BWR Vessel Internals and Water Chemistry	BWR Vessel Internals (B.1.7) and Water Chemistry Control-BWR (B.1.29.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Steel piping, piping components, and piping elements exposed to reactor coolant (3.1.1-45)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (B.1.14)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Nickel alloy core shroud and core plate access hole cover (mechanical covers) (3.1.1-46)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	Not Applicable	Not applicable (See SER Section 3.1.2.1.8)
Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant (3.1.1-47)	Loss of material due to pitting and crevice corrosion	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	Water Chemistry Control-BWR (B.1.29.2), BWR Vessel Internals (B.1.7), and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.3)
Steel and stainless steel Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-48)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (for stainless steel only), and thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	Inservice Inspection (B.1.16.2), Water Chemistry Control-BWR (B.1.29.2), and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy core shroud and core plate access hole cover (welded covers) (3.1.1-49)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), Water Chemistry, and, for BWRs with a crevice in the access hole covers, augmented inspection using UT or other demonstrated acceptable inspection of the access hole cover welds	BWR Vessel Internals (B.1.7) and Water Chemistry Control -BWR (B.1.29.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.5)
High-strength low alloy steel top head closure studs and nuts exposed to air with reactor coolant leakage (3.1.1-50)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	Reactor Head Closure Studs	Reactor Head Closure Studs (B.1.23)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Cast austenitic stainless steel jet pump assembly castings; orificed fuel support (3.1.1-51)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	Thermal Aging and Neutron Irradiation Embrittlement of CASS (B.1.28)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
Steel and stainless steel reactor coolant pressure boundary (RCPB) pump and valve closure bolting, manway and holding bolting, flange bolting, and closure bolting in high-pressure and high-temperature systems (3.1.1-52)	Cracking due to stress corrosion cracking, loss of material due to wear, loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity (B.1.30)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1)
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	Not Applicable	Not applicable (See SER Section 3.1.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water (3.1.1-54)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Not Applicable	Not applicable (See SER Section 3.1.2.1.8)
Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant > 250°C (> 482°F) (3.1.1-55)	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection (IWB, IWC, and IWD). Thermal aging susceptibility screening is not necessary, inservice inspection requirements are sufficient for managing these aging effects. ASME Code Case N-481 also provides an alternative for pump casings.	Inservice Inspection (B.1.16.2) or One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.6)
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	Not Applicable	Not applicable (See SER Section 3.1.2.1.8)
Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant > 250°C (> 482°F) (3.1.1-57)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.1.2.1.7)
Steel reactor coolant pressure boundary external surfaces exposed to air with borated water leakage (3.1.1-58)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/steam (3.1.1-59)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Not Applicable	Not applicable to BWRs
Stainless steel flux thimble tubes (with or without chrome plating) (3.1.1-60)	Loss of material due to Wear	Flux Thimble Tube Inspection	Not Applicable	Not applicable to BWRs
Stainless steel, steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F) (3.1.1-61)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	Not Applicable	Not applicable to BWRs
Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant (3.1.1-62)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD)	Not Applicable	Not applicable to BWRs
Steel reactor vessel flange, stainless steel and nickel alloy reactor vessel internals exposed to reactor coolant (e.g., upper and lower internals assembly, CEA shroud assembly, core support barrel, upper grid assembly, core support shield assembly, lower grid assembly) (3.1.1-63)	Loss of material due to Wear	Inservice Inspection (IWB, IWC, and IWD)	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and steel with stainless steel or nickel alloy cladding pressurizer components (3.1.1-64)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry	Not Applicable	Not applicable to BWRs
Nickel alloy reactor vessel upper head and control rod drive penetration nozzles, instrument tubes, head vent pipe (top head), and welds (3.1.1-65)	Cracking due to primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD) and Water Chemistry and Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors	Not Applicable	Not applicable to BWRs
Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/or steam (3.1.1-66)	Loss of material due to erosion	Inservice Inspection (IWB, IWC, and IWD) for Class 2 components	Not Applicable	Not applicable to BWRs
Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant (3.1.1-67)	Cracking due to cyclic loading	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	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 stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	Not Applicable	Not applicable to BWRs
Stainless steel, nickel alloy safety injection nozzles, safe ends, and associated welds and buttering exposed to reactor coolant (3.1.1-69)	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Inservice Inspection (IWB, IWC, and IWD), and Water Chemistry	Not Applicable	Not applicable to BWRs
Stainless steel; steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant (3.1.1-70)	Cracking due to stress corrosion cracking, thermal and mechanical loading	Inservice Inspection (IWB, IWC, and IWD), Water chemistry, and One-Time Inspection of ASME Code Class 1 Small-bore Piping	Not Applicable	Not applicable to BWRs
High-strength low alloy steel closure head stud assembly exposed to air with reactor coolant leakage (3.1.1-71)	Cracking due to stress corrosion cracking; loss of material due to wear	Reactor Head Closure Studs	Not Applicable	Not applicable to BWRs
Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater/steam (3.1.1-72)	Cracking due to OD stress corrosion cracking and intergranular attack, loss of material due to fretting and wear	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant (3.1.1-73)	Cracking due to primary water stress corrosion cracking	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs
Chrome plated steel, stainless steel, nickel alloy steam generator anti-vibration bars exposed to secondary feedwater/steam (3.1.1-74)	Cracking due to stress corrosion cracking, loss of material due to crevice corrosion and fretting	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs
Nickel alloy once-through steam generator tubes exposed to secondary feedwater/steam (3.1.1-75)	Denting due to corrosion of carbon steel tube support plate	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs
Steel steam generator tube support plate, tube bundle wrapper exposed to secondary feedwater/steam (3.1.1-76)	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs
Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater/steam (3.1.1-77)	Loss of material due to wastage and pitting corrosion	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs
Steel steam generator tube support lattice bars exposed to secondary feedwater/steam (3.1.1-78)	Wall thinning due to flow-accelerated corrosion	Steam Generator Tube Integrity and Water Chemistry	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Nickel alloy steam generator tubes exposed to secondary feedwater/steam (3.1.1-79)	Denting due to corrosion of steel tube support plate	Steam Generator Tube Integrity; Water Chemistry and, for plants that could experience denting at the upper support plates, evaluate potential for rapidly propagating cracks and then develop and take corrective actions consistent with Bulletin 88-02.	Not Applicable	Not applicable to BWRs
Cast austenitic stainless steel reactor vessel internals (e.g., upper internals assembly, lower internal assembly, CEA shroud assemblies, control rod guide tube assembly, core support shield assembly, lower grid assembly) (3.1.1-80)	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	Not Applicable	Not applicable to BWRs
Nickel alloy or nickel-alloy clad steam generator divider plate exposed to reactor coolant (3.1.1-81)	Cracking due to primary water stress corrosion cracking	Water Chemistry	Not Applicable	Not applicable to BWRs
Stainless steel steam generator primary side divider plate exposed to reactor coolant (3.1.1-82)	Cracking due to stress corrosion cracking	Water Chemistry	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor vessel internals and reactor coolant pressure boundary components exposed to reactor coolant (3.1.1-83)	Loss of material due to pitting and crevice corrosion	Water Chemistry	Not Applicable	Not applicable to BWRs
Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater/steam (3.1.1-84)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection or Inservice Inspection (IWB, IWC, and IWD).	Not Applicable	Not applicable to BWRs
Nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.1.1-85)	None	None	None	Consistent with GALL Report
Stainless steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (External); air with borated water leakage; concrete; gas (3.1.1-86)	None	None	None	Consistent with GALL Report
Steel piping, piping components, and piping elements in concrete (3.1.1-87)	None	None	Not Applicable	Not applicable (See SER Section 3.1.2.1.8)

The staff's review of the RV, internals, and RCS component groups followed one of several approaches. One approach, documented in SER Section 3.1.2.1, discusses the staff's review of the AMR results for components that the applicant indicated are consistent with the GALL

Report and do not require further evaluation. Another approach, documented in SER Section 3.1.2.2, discusses the staff's review of the 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, discusses the staff's review of the 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 that are credited to manage or monitor aging effects of the RV, internals, and RCS components is documented in SER Section 3.0.3.

3.1.2.1 AMR Results That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.1.2.1, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the effects of aging related to the RV, internals, and RCS components:

- BWR CRD Return Line Nozzle Program
- BWR Feedwater Nozzle Program
- BWR Penetrations Program
- BWR Stress Corrosion Cracking Program
- BWR Vessel ID Attachment Welds Program
- BWR Vessel Internals Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Inservice Inspection Program
- One-Time Inspection Program
- Reactor Head Closure Studs Program
- Reactor Vessel Surveillance Program
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program
- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program
- Bolting Integrity Program

In LRA Tables 3.1.2-1 through 3.1.2-3, the applicant provided a summary of AMRs for the RV, internals, and RCS components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes describe how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E, which indicate that 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report and the 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant is consistent with the AMP identified in the GALL Report 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 AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report that has the same material, environment, aging effect, and AMP as the component that was 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 AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report 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 a different AMP is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit and review of the information provided in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff’s evaluation is discussed below.

3.1.2.1.1 Cracking due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, and Cyclic Loading

LRA Table 3.1.1, Item 3.1.1- 40, addresses cracking due to SCC, IGSCC, and cyclic loading for stainless steel and nickel alloy penetrations for control rod drive stub tubes, instrumentation, jet pump instrumentation, standby liquid control, and flux monitor exposed to reactor water. The applicant has addressed cracking of the RV drain line nozzle penetration, which is low-alloy steel with stainless steel cladding, along with other low-alloy steel vessel nozzle penetrations with stainless steel cladding, in SER Table 3.1.1-41 (See Section 3.1.2.1.2 of this SER). The LRA credits the Water Chemistry Control-BWR Program, and either the BWR Penetrations Program for Core ΔP/SLC nozzle and instrument nozzles, BWR Vessel Internals Program for CRD stub tubes or Inservice Inspection Program for incore monitor housings to manage this aging effect. GALL Report recommends AMPs XI.M8, "BWR Penetrations," and XI.M2,"Water Chemistry," to manage this aging effect. The LRA Table 2 AMR line items (low-alloy steel with nickel-based alloy cladding CRD stub tubes and stainless steel incore monitor housings) that reference this Table 1 line item cite Generic Note E, indicating that the AMR lines are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff' reviewed the applicant's Water Chemistry Control-BWR Program and BWR Penetrations Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.2.4, respectively. The staff verified that these aging management programs include activities that are consistent with the recommendations in the GALL AMPs XI.M8 and XI.M2 to manage cracking due to SCC and IGSCC for stainless steel and nickel-based alloy components exposed to reactor water. The staff noted that the CRD stub tube penetrations, which are made out of low-alloy steel with nickel-based alloy cladding, and the stainless steel incore monitor housing penetrations are not within the scope of the BWR Penetrations Program. The inspection and flaw evaluation guidelines given in BWRVIP-47A applicable to the vessel lower plenum components, which includes the CRD housing and stub tubes, are within the scope of BWR Vessel Internals Program. Therefore, the applicant appropriately did not credit the BWR Penetrations Program for managing cracking for these two components. The staff determined that, in LRA Table 3.1.2-1, cracking of the CRD stub tubes is appropriately managed by the BWR Vessel Internals Program, which incorporates the guidelines of the staff-approved BWRVIP-47A for the CRD stub tubes. The staff reviewed the JAFNPP BWR Vessel Internals Program for consistency with GALL Report, along with the applicable BWRVIP documents, and found that the applicant does not take any exceptions to BWRVIP-47A. Therefore, the staff finds the BWR Vessel Internals Program acceptable for managing cracking of the CRD stub tubes.

In addition, the staff noted that cracking for the incore monitor housings is managed by the Inservice Inspection Program.

During the audit and review, the staff asked the applicant to provide its technical justification for not using the BWR Vessel Internals Program to manage aging for these components. In its response, the applicant stated that it will amend the LRA to include the BWR Vessel Internals Program, in addition to the Inservice Inspection Program, to manage aging of these components. In its letter dated February 1, 2007, the applicant amended the LRA to include the BWR Vessel Internals Program, in addition to the Inservice Inspection Program in LRA

Table 3.1.2-2, “Reactor Vessel Internals,” to manage aging of these components. The staff’s evaluation of the applicant’s BWR Vessel Internals Program and Inservice Inspection Program are documented in SER Sections 3.0.3.2.7 and 3.0.3.3.3, respectively. The staff determined that this LRA amendment is acceptable since the BWR Vessel Internals Program includes the BWRVIP-47A recommendations for the incore housings without exception. The staff also noted that the applicant’s Inservice Inspection Program performs volumetric or surface examination of 10% of the peripheral CRD housing welds and periodic leak testing of the RV lower head (including both the CRD stub tubes), and the incore housing.

Based on the above, the staff finds that the BWR Vessel Internals Program, along with the Inservice Inspection Program and Water Chemistry Control-BWR Program, will provide adequate assurance that these pressure boundary components will perform their intended functions during the period of extended operation. On this basis, the staff finds the AMR results for this line item acceptable.

3.1.2.1.2 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

LRA Table 3.1.1, Item 3.1.1- 41, addresses cracking due to SCC and IGSCC for stainless steel and nickel alloy piping, piping components, and pipe elements (nozzle safe ends and associated welds) greater than or equal to 4 inches NPS exposed to reactor water. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E for 14 component types, indicating that the AMR lines are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited. The LRA credits the Water Chemistry Control-BWR Program and the BWR Stress Corrosion Cracking Program, further supplemented by the Inservice Inspection Program for some components to manage aging for these components. For other components, to which the BWR Stress Corrosion Cracking Program is not applicable, the applicant manages this aging effect using the Water Chemistry Control-BWR Program, and either the BWR Feedwater Nozzle Program, BWR Vessel Internals Program, One-Time Inspection Program or Inservice Inspection Program. The GALL Report recommends AMPs XI.M7, "BWR Stress Corrosion Cracking," and XI.M2, "Water Chemistry," to manage this aging effect.

The staff reviewed the applicant’s Water Chemistry Control-BWR Program and BWR Stress Corrosion Cracking Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.2.5, respectively. The staff verified that these aging management programs include activities that are consistent with the recommendations in GALL AMPs XI.M7 and XI.M2 to manage cracking due to SCC and IGSCC for stainless steel and nickel-based alloy components exposed to reactor water. In addition, the staff reviewed the scope of the BWR Stress Corrosion Cracking Program and found that this program is applicable to stainless steel RV nozzle safe ends greater than 4 inches NPS [i.e., core spray, jet pump instrument, and reactor water recirculation (RWR) inlet and outlet nozzles]; RWR flow elements, pump casings and covers; and piping, pipe fittings, and valve bodies of the reactor coolant pressure boundary (RCPB) that are greater than 4 inches NPS. Therefore, the applicant appropriately did not credit the BWR Stress Corrosion Cracking Program for managing cracking for several RV and RCPB components that are not within the scope of this program. The staff finds that, for components addressed by this AMR line item, crediting the Water Chemistry Control-BWR Program together with the BWR Stress Corrosion Cracking Program is consistent with the

recommendations in the GALL Report, and is acceptable.

The staff noted that, in LRA Table 3.1.2-1, for AMR line items that reference line Item 3.1.1-41, cracking of the nozzle-to-safe end welds less than 4 inches NPS (i.e., SLC nozzle-to-safe end weld), safe ends less than 4 inches NPS (i.e., Core Delta P/SLC and instrumentation), and thermal sleeves for core spray and RWR inlet nozzles is managed by the BWR Vessel Internals Program, together with the Water Chemistry Control-BWR Program. In addition, cracking of the feedwater thermal sleeve is managed by the BWR Feedwater Nozzle Program together with the Water Chemistry Control-BWR Program. The staff reviewed the applicant's Water Chemistry Control-BWR Program, BWR Stress Corrosion Cracking Program, BWR Feedwater Nozzle Program, and BWR Vessel Internals Program, along with applicable BWRVIP/industry documents and its evaluations are documented in SER Sections 3.0.3.1.10, 3.0.3.2.5, 3.0.3.2.3, and 3.0.3.3.3, respectively. The staff confirmed that these thermal sleeves are not within the scope of the BWR Stress Corrosion Cracking Program since they are not part of the Code-required pressure boundary components, and they are not welded to the safe ends. The staff determined that these AMPs are consistent with the recommendations in the GALL Report, and include inspections that are equivalent to those in the BWR Stress Corrosion Cracking Program for managing cracking due to SCC and IGSCC. Therefore, the staff finds that these programs, along with the Water Chemistry Control-BWR Program, will provide adequate assurance that cracking due to SCC and IGSCC for the components addressed by this AMR will be managed. On this basis, the staff finds that, for the components addressed by this AMR, crediting the Water Chemistry Control-BWR Program together with either the BWR Feedwater Nozzle Program or BWR Vessel Internals Program to manage SCC and IGSCC is acceptable.

The staff also noted that, in LRA Table 3.1.2-1, for AMR line items that reference line Item 3.1.1-41, cracking of stainless steel flange leakoff nozzles less than 4 inches NPS, and low-alloy steel components with stainless steel (full or partial) cladding (i.e, vessel shell components and vessel nozzles, including the drain line nozzle penetration) are managed by the applicant’s Inservice Inspection Program, in accordance with Section XI of the ASME Code. The staff reviewed the applicant’s Inservice Inspection Program, along with the applicable Code section. The staff determined that this program is consistent with the recommendations in the GALL Report, and includes inspections that are described in GALL AMP XI.M7 for managing cracking due to SCC and IGSCC. The staff determined that the Inservice Inspection Program will provide adequate assurance that cracking due to SCC and IGSCC for these vessel components will be managed. On this basis, the staff finds that, for the components addressed by these AMR line items that reference Table 3.1.1-41, crediting the Water Chemistry Control-BWR Program together with the Inservice Inspection Program to manage SCC and IGSCC is acceptable.

In LRA Table 3.1.2-3, for AMRs that reference line Item 3.1.1-41, cracking of CASS main steam flow restrictors is managed by the applicant’s Water Chemistry Control-BWR Program and One-Time Inspection Program. The staff reviewed the applicant’s Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10, and 3.0.3.1.6, respectively. The staff determined that it includes inspections using NDE techniques that will be effective for detecting cracking of CASS components. The staff finds that, since the main steam flow restrictors are not pressure boundary components, they do not require periodic inservice examinations; therefore, the

One-Time Inspection Program is acceptable to manage cracking due to SCC or IGSCC for these components. If cracking is detected, appropriate corrective actions will be taken to mitigate the aging effect. On this basis, the staff finds that, for the components addressed by these AMR line items, crediting the Water Chemistry Control-BWR Program together with the One-Time Inspection Program to manage SCC and IGSCC is acceptable.

The staff finds that either the BWR Vessels Internals Program, BWR Feedwater Nozzle Program, One-Time Inspection Program, or Inservice Inspection Program, along with the Water Chemistry Control-BWR Program, will provide adequate assurance that these vessel components will perform their intended functions during the period of extended operation. On this basis, the staff finds the AMR results for this line item acceptable.

3.1.2.1.3 Loss of Material due to Pitting and Crevice Corrosion

LRA Table 3.1.1, Item 3.1.1- 47, addresses loss of material due to pitting and crevice corrosion for stainless steel and nickel alloy RV internals exposed to reactor water. The LRA credits the Water Chemistry Control-BWR Program and the One-Time Inspection Program to manage this aging effect. The GALL Report recommends AMPs XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and XI.M2, "Water Chemistry," to manage this aging effect. The LRA also states that the Inservice Inspection Program is not applicable to most RV internal components since they are not part of the pressure boundary. The LRA Table 2 AMR line items that reference this Table 1 line item (GALL Report, Table IV, Item B1-15) cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff noted that, in LRA Table 3.1.2-2, for AMR line items that reference Table 3.1.1, line Item 47, loss of material in sixteen RV internal components is managed by the Water Chemistry Control-BWR Program and the One-Time Inspection Program. The staff reviewed the Water Chemistry Control-BWR and the BWR Vessel Internals Program for consistency with GALL AMPs XI.M2 and XI.M9, and found that these AMPs are adequate to manage loss of material due to pitting and crevice corrosion in the vessel internals components addressed by this AMR line item. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Program at stagnant flow locations in crevices present in the vessel internals components. The staff's evaluation of the applicant's Water Chemistry Control-BWR Program, One-Time Inspection Program, and BWR Vessel Internals Program are documented in SER Sections 3.0.3.1.10, 3.0.3.1.6, and 3.0.3.2.7, respectively.

During the audit and review, the staff asked the applicant to clarify why the ASME Code-required Inservice Inspections that are performed in accordance with Subsection IWB, Table IWB-2500-1, Category B-N-2, are not credited to manage this aging effect. In its response, the applicant stated that, although Inservice Inspection is performed, it is not credited to manage this aging effect due to the location of these components inside the RV. The applicant further stated that the BWR Vessel Internals Program provides more effective inspection of these components in accordance with BWRVIP documents. The applicant committed to amend the LRA to revise all Table 2 line items referencing AMR line Item 3.1.1-47 for vessel internal components to credit the BWR Vessel Internals Program (GALL AMP XI.M9) in addition to the Water Chemistry Control-BWR Program. In its letter dated February 1, 2007,

the applicant amended the LRA to include the BWR Vessel Internals Program, in addition to the Inservice Inspection Program in LRA Table 3.1.2-2, "Reactor Vessel Internals," to manage aging of these components. In addition, the discussion column of LRA Table 3.1.1, line Item 3.1.1-47, the applicant added the following:

> JAFNPP performs all the inspections required by the ASME Section XI Inservice Inspection Program, but this program is not credited for managing loss of material because it does not specifically inspect many of the RV internals components. JAFNPP credits the BWR Vessel Internals Program which incorporates the requirements of ASME Section XI, the approved BWRVIP documents, and other approved industry documents such as vendor letters and NUREGs.

On the basis of its review of AMR results for the line item as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the ARM appropriately as recommended by the GALL Report.

3.1.2.1.4 Cracking due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, and Thermal and Mechanical Loading

LRA Table 3.1.1, Item 3.1.1-48, addresses cracking due to SCC, IGSCC (for stainless steel only), and thermal and mechanical loading for steel and stainless steel Class 1 piping, fittings and branch connections less than 4 inches NPS exposed to reactor water. The LRA credits the Water Chemistry Control-BWR Program, One-Time Inspection Program and the Inservice Inspection Program to manage this aging effect, with several exceptions. For condensing chambers, CRD filter housings, and orifices, only the Water Chemistry Control-BWR and One-time Inspection Programs are credited. For the control rod drive units, only the Water Chemistry Control-BWR and ISI Programs are credited. The GALL Report recommends AMPs XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,"XI.M2, "Water Chemistry,"and XI. M35, "One-Time Inspection of ASME Code Class 1 Small Bore-Piping," to manage this aging effect. The LRA Table 2 AMR line items that reference this Table1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff noted that, in LRA Table 3.1.2-3, for AMR line items that reference Table 3.1.1, Item 3.1.1-48, cracking of condenser chambers, CRD filter housings, and orifices are managed by the Water Chemistry Control-BWR Program and the One-Time Inspection Program. Also, cracking of the control rod drive unit pressure boundary components are managed by the Water Chemistry Control-BWR Program and the Inservice Inspection Program.

During the audit and review, the staff asked the applicant to clarify why all three AMPs recommended in the GALL Report are not credited to manage cracking of these components. In its response, the applicant committed to amend the LRA to add the Inservice Inspection Program to the AMRs for components condensing chambers, CRD filter housings and orifices. In February 01, 2007, the applicant amended LRA Table 3.1.2-3, for AMRs that reference line Item 3.1.1-48, to add the Inservice Inspection Program to the AMRs for condensing chambers,

CRD filter housings and orifices. The staff finds this LRA amendment acceptable since it will make these AMRs consistent with the recommendations in the GALL Report.

For the AMR line items addressing the CRD units, the applicant stated that since these components are not small bore piping, the One-Time Inspection Program does not apply. Therefore, the Inservice Inspection Program along with the Water Chemistry Control-BWR Program are adequate to manage cracking. The staff reviewed the applicant’s Inservice Inspection Program and found that this AMP includes periodic inspections that will be effective for detecting cracking in the CRD units. The staff finds that the applicant's Inservice Inspection Program along with the Water Chemistry Control-BWR Program, will provide adequate assurance that cracking due to SCC, IGSCC, and IASCC will be managed for these components.

During the audit and review, the staff also asked the applicant to clarify why generic note E is cited for AMR line items crediting all AMPs recommended by GALL Report. In its response, the applicant stated that Generic Note E is used since the JAFNPP Inservice Inspection Program is considered to be a plant-specific program. The staff finds this acceptable since it is administrative only and does not impact the technical aspects of the aging management activities.

The staff finds that, for the components piping and pipe elements less than 4 inches NPS, condensing chambers, CRD filter housings, orifices, and CRD pressure boundary components addressed by this AMR, the use of the Water Chemistry Control-BWR Program, Inservice Inspection Program, and One-Time Inspection Program will effectively manage cracking due to SCC, IGSCC and cracking due to thermal and mechanical loading. On this basis, the staff finds the AMR results for this line item acceptable.

3.1.2.1.5 Cracking due to Stress Corrosion Cracking, Intergranular Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

LRA Table 3.1.1, Item 3.1.1-49, addresses cracking due to SCC, IGSCC, and IASCC for nickel alloy core shroud and core plate access hole cover (welded) exposed to reactor water. The LRA credits the Water Chemistry Control-BWR Program and the BWR Vessel Internals Program to manage this aging effect. The GALL Report recommends AMPs XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," with augmented inspections for welded access hole covers containing crevices, and XI.M2, "Water Chemistry," to manage this aging effect. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff noted that, in LRA Table 3.1.2-2, for AMRs that reference Table 3.1.1, Item 3.1.1-49, cracking of the welded access hole cover (indicated as manway covers) is managed by the BWR Vessel Internals Program and Water Chemistry Control-BWR Program. The staff reviewed the applicant’s Water Chemistry Control-BWR Program and BWR Vessel Internals Program and its evaluations are documented in SER Sections 3.0.3.1.10, and 3.0.3.2.7, respectively. The applicant's BWR Vessel Internals Program includes implementation of the BWRVIP-15 program. The LRA also states that the welded access hole covers have no crevice behind the weld at JAFNPP.

During the audit and review, the staff asked the applicant to clarify how the access hole covers were welded to the core support plate without creating a creviced region behind the weld.

In response, the applicant provided a diagram showing the access hole cover design for JAFNPP. The diagram was obtained from BWRVIP-15, Section 10, which states that the access hole covers applicable to JAFNPP are welded to the shroud support ledge with a full penetration weld that leaves no crevice behind the weld, as shown in BWRVIP-15, Figure 2.10.2.4. The staff also reviewed BWRVIP-15 including the plant drawings and determined that the JAFNPP access hole cover does not have a crevice behind the weld. The staff determined that these AMPs include GALL AMPs XI.M1 and XI.M2 recommendations, and will provide adequate assurance that cracking due to SCC, IGSCC, and IASCC for these components will be managed. On this basis, the staff finds the AMR results for this line item acceptable.

3.1.2.1.6 Loss of Fracture Toughness due to Thermal Aging Embrittlement

LRA Table 3.1.1, Item 3.1.1-55, addresses loss of fracture toughness due to thermal embrittlement in CASS Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant water greater than 250ºC. The LRA credits the Inservice Inspection Program for the recirculation pump casing and cover, and valve bodies greater than or equal to 4 inches NPS. The valve bodies less than 4 inches NPS are inspected by the One-Time Inspection Program to manage loss of fracture toughness. The GALL Report recommends AMP XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," to manage this aging effect. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff noted that, in LRA Table 3.1.2-3, for AMR line items that reference Table 3.1.1, Item 3.1.1-55, loss of fracture toughness is managed by either the One-Time Inspection Program or the Inservice Inspection Program. Both of these programs will detect cracking that is symptomatic of a reduction of fracture toughness using NDE techniques. For recirculation pump casings and valve bodies greater or equal to 4 inches NPS, the aging effect is managed by the Inservice Inspection Program, which is consistent with GALL AMP XI.M1. The staff also notes that note E is retained for these items since the JAFNPP Inservice Inspection Program is considered to be a plant-specific program. Since the AMP credited is consistent with the recommendations in GALL AMP XI.M1, the staff finds these AMR line items acceptable.

For the valve bodies less than 4 inches NPS, the applicant performs the Inservice Inspection Program, which includes surface examination and leak testing as part of the Code requirement. However, the applicant is not crediting this AMP for managing this aging effect since no volumetric examinations are required by the program. Instead, in addition to applicant's inservice inspections, the applicant credits the One-Time Inspection Program. Since these components are important for safe operation of the system and are considered to be a pressure boundary component, the staff finds this acceptable. On this basis, the staff finds the AMR results for this line item acceptable.

3.1.2.1.7 Loss of Fracture Toughness due to Thermal Aging Embrittlement

LRA Table 3.1.1,Item 3.1.1-57, addresses loss of fracture toughness due to thermal embrittlement in CASS Class 1 piping, piping components, and piping elements exposed to reactor coolant water greater than 250 °C. The LRA credits the One-Time Inspection Program to manage loss of fracture toughness. GALL Report recommends AMP XI.M12,"Thermal Aging Embrittlement of Cast Austenitic Stainless Steel," to manage this aging effect. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff noted that the applicant does not have an AMP equivalent to the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program recommended by the GALL report. This AMP manages loss of fracture toughness in CASS Class 1 piping, piping components, piping elements and CRD pressure housings exposed to reactor coolant greater than 250°C. The applicant has no such components within the scope of the license renewal except the main steam flow restrictors, which are not pressure boundary components and are not subject to any inservice inspections. The applicant credits the One-Time Inspection Program to manage loss of fracture toughness in the main steam flow restrictors. The staff reviewed the JAFNPP One-Time Inspection Program for consistency with GALL AMP XI.M12 and its evaluation is documented in SER Section 3.0.3.1.6. The staff determined that this AMP includes inspections using NDE methods specified in the GALL AMP XI.M12 that will detect the presence of cracking, which is symptomatic of a loss of fracture toughness. The staff finds that the One-Time Inspection Program will provide adequate assurance that these components will perform their intended functions during the period of extended operation. On this basis, the staff finds the AMR results for this line item acceptable.

3.1.2.1.8 AMR Results Identified as Not Applicable

In LRA Table 3.1.1, line Items 46, 53, 54, 56, and 87 are identified as “Not Applicable” since the component/material/environment combination does not exist at JAFNPP. For each of these line items, the staff reviewed the LRA and the applicant’s supporting documents, and confirmed the applicant’s claim that the component/material/ environment combination does not exist at JAFNPP. On the basis that JAFNPP does not have the component/material/ environment combination for these Table 1 line items, the staff finds that these AMR line items are not applicable to JAFNPP.

Conclusion. The staff evaluated the applicant’s claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant’s consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.1.2.2, the applicant provided further evaluation of aging management, as recommended by the GALL Report, for the RV, internals, and RCS components. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of fracture toughness due to neutron irradiation embrittlement
- cracking due to stress corrosion cracking and intergranular stress corrosion cracking
- crack growth due to cyclic loading
- loss of fracture toughness due to neutron irradiation embrittlement and void swelling
- cracking due to stress corrosion cracking
- cracking due to cyclic loading
- loss of preload due to stress relaxation
- loss of material due to erosion
- cracking due to flow-induced vibration
- cracking due to stress corrosion cracking and irradiation-assisted stress corrosion cracking
- cracking due to primary water stress corrosion cracking
- wall thinning due to flow-accelerated corrosion
- changes in dimensions due to void swelling
- cracking due to stress corrosion cracking and primary water stress corrosion cracking
- cracking due to stress corrosion cracking, primary water stress corrosion cracking, and irradiation-assisted stress corrosion cracking
- QA for aging management of nonsafety-related components

For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL 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 3.1.2.2.

The staff’s evaluation of the aging effects is discussed in the following sections.

3.1.2.2.1 Cumulative Fatigue Damage

The staff reviewed LRA Section 3.1.2.2.1 against the SRP-LR Section 3.1.2.2. criteria.

SRP-LR Section 3.1.2.2.1states that Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in SRP-LR Section 4.3, "Metal Fatigue Analysis."

In LRA Section 3.1.2.2.1, the applicant stated that fatigue is a TLAA, as defined in 10 CFR 54.3. The evaluation of fatigue for the RV is discussed in LRA Section 4.3.1.1. The RV internals are not part of the RCPB. Although not mandatory, fatigue analyses were performed for selected RV internal components (i.e., core shroud tie rod assembly components and jet pump assembly diffuser adapters). For those internal components analyzed, the evaluation of fatigue is discussed in LRA Section 4.3.1.2. Cracking, including cracking due to fatigue, will be managed by the BWR Vessel Internals Program for other internal components. With the exception of the main steam line flow restrictors and reactor water recirculating pumps, evaluation of the fatigue TLAA for the Class 1 portions of the RCPB piping and components, including those for interconnecting systems is discussed in LRA Section 4.3.1.3. No fatigue analysis was required for the main steam line flow restrictors or reactor water recirculating pumps. Cracking, including cracking due to fatigue, will be managed by the One-Time Inspection Program for the main steam line flow restrictors, and by the Inservice Inspection Program for the reactor water recirculating pumps.

The staff noted that, in LRA Section 4.3.1.3, the applicant stated that no RCPB piping components will exceed the as-designed 7000 full-temperature cycles in 60 years of operation, and the existing stress analyses remain valid for the period of extended operation, in accordance with 10CFR54.21(c)(1)(I). However, in LRA Section 3.1.2.2.1, the applicant has taken exception to including the main steam line flow restrictors and RWR pumps in the RCPB components requiring a fatigue TLAA. Also, in LRA Table 3.1.2-3 the staff noted that the applicant has credited the One-Time Inspection Program for the main steam flow restrictors, and the Inservice Inspection Program for the recirculation pump for managing cracking due to fatigue, as well as loss of fracture toughness.

Therefore, during the audit and review, the staff asked the applicant to clarify why exceptions are taken for these two components in the RCS.

In response, the applicant stated that the main steam line flow restrictors and reactor water recirculation pumps were not designed to a Code that required fatigue analysis. Therefore, cracking due to fatigue will be managed by the same AMPs that manage cracking due to other mechanisms in accordance with 10CFR54.21(c)(1)(iii).

The applicant also stated that fatigue-induced aging effects (i.e., damage which would manifest itself in the initiation of a fatigue induced crack) in the of main steam flow restrictors will be managed by the One-Time Inspection AMP since these are not pressure boundary components requiring inservice examinations as recommended in GALL Report. The staff reviewed the applicant's One-Time Inspection Program and its evaluations are discussed in SER Section 3.0.3.1.6. The staff determined that these CASS components are susceptible to cracking due to fatigue and SCC, and loss of fracture toughness, and are important for the safe

operation of the system. Since they are not subject to periodic inservice examinations by the ASME Code, a One-Time Inspection is appropriate to determine their condition prior to the period of extended operation. If cracks induced by fatigue are detected, appropriate corrective actions will be taken to mitigate the aging effect. On this basis, the staff finds the One-Time Inspection Program acceptable for managing fatigue-induced aging effects.

The applicant further stated that fatigue-induced aging effects reactor water recirculation pumps will be managed by the Inservice Inspection Program since these are reactor water pressure boundary components and are subject to periodic examinations in accordance with the ASME Code. The pump casing welds are examined in accordance with IWB-2500-1, Category B-L-1, while the pump casing itself is examined per Category B-L-2. Since the JAFNPP recirculation pump casings are CASS components and have no welds, the casings are examined for cracking using Code-recommended NDE techniques for Code Category B-L-2. The staff determined that the Code-recommended examinations will effectively detect any cracking that would initiate for fatigue or other aging mechanisms; therefore, they will provide reasonable assurance that these components will perform their intended functions during the period of extended operation. Therefore, the staff finds this acceptable.

In LRA Section 3.1.2.2.1, the applicant stated that fatigue analyses were performed for selected vessel internal components (i.e., core shroud tie rod assemblies and jet pump diffuser adapters). For those vessel internal components that were not analyzed for fatigue, cracking, including cracking due to fatigue, will be managed by the BWR Vessel Internals Program. Since these components serve no pressure boundary function and are not subject to any surface or volumetric examinations, the vessel internals program will visually inspect them periodically and will detect the presence of any cracking. The staff's evaluation of BWR Vessel Internals Program is discussed in SER Section 3.0.3.2.7. The staff finds that these periodic visual inspections will provide reasonable assurance that these reactor internal components will perform their intended functions during the period of extended operation. Therefore, the staff finds this acceptable.

The staff further noted that in LRA Table 3.1.1, line Items 6, 7, 8, 9, and 10 for cumulative fatigue are identified as “Not Applicable” because JAFNPP is a BWR plant for which the component/material/ environment combination does not exist.

The staff’s review of the TLAAs in LRA Section 4.3 related to metal fatigue of all Class 1 components within the RV, the RV internals, and the RCPB is presented in SER Section 4.3.1.

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 SRP-LR Section 3.1.2.2.2 criteria.

(1) In LRA Section 3.1.2.2.2, Item 1, the applicant addressed loss of material due to general, pitting, and crevice corrosion in steel components of the reactor pressure vessel exposed to reactor coolant. The applicant stated that this aging effect is managed at JAFNPP by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program, including areas of stagnant flow.

SRP-LR Section 3.1.2.2.2, Item 1, states that loss of material due to general, pitting, and crevice corrosion could occur in BWR steel top head enclosure (without cladding) top head nozzles (vent, top head spray or reactor core isolation cooling (RCIC), and spare) exposed to reactor coolant. The existing program relies on control of reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's One-Time Inspection Program and Water Chemistry Control-BWR Program and its evaluations are documented in SER Sections 3.0.3.1.6 and 3.0.3.1.10, respectively. The staff noted that the aging effect is managed by the applicant's Water Chemistry Control-BWR Program. In addition, the effectiveness of the water chemistry control program will be verified by the One-Time Inspection Program.

During the audit and review, the staff reviewed the program basis document for the One-Time Inspection Program and confirmed that NDEs (including VT-1, ultrasonic, and surface techniques) will be performed on a representative sample by qualified personnel following procedures that are consistent with ASME Code Section XI and 10 CFR 50, Appendix B. In addition, follow-up of unacceptable inspection findings will include expansion of sample size and locations. Therefore, the staff determined that loss of material due to general, pitting, and crevice corrosion in these RV components will be adequately managed by the Water Chemistry Control-BWR and One-Time Inspection AMPs. On this basis, the staff finds that applicant has met the criteria of SRP-LR Section 3.1.2.2.2, Item 1, for further evaluation.

(2) In LRA Section 3.1.2.2.2, Item 2, the applicant stated that the paragraph in SRP-LR Section 3.1.2.2.2 pertains to BWR isolation condenser components. JAFNPP does not have an isolation condenser; however, loss of material due to general, pitting, and crevice corrosion in other steel components within the RCPB exposed to reactor coolant is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

SRP-LR Section 3.1.2.2.2 states that loss of material due to pitting and crevice corrosion could occur in stainless steel BWR isolation condenser components exposed to reactor coolant. Loss of material due to general, pitting, and crevice corrosion could occur in steel BWR isolation condenser components. The existing program relies on control of reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL

Report recommends further evaluation of programs to verify the effectiveness of the chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's One-Time Inspection Program and Water Chemistry Control-BWR Program and its evaluations are documented in SER Sections 3.0.3.1.6 and 3.0.3.1.10, respectively. The staff confirmed that JAFNPP does not have isolation condensers in the RCS. However, the applicant credits these programs to manage the loss of material due to general, pitting, and crevice corrosion in other steel components within the RCPB exposed to reactor coolant. This aging effect is managed by the Water Chemistry Control-BWR Program. The effectiveness of the water chemistry control program will be verified by the One-Time Inspection Program. The staff reviewed the AMR tables in LRA Section 3.1 and found that several steel components (i.e., piping and pipe fittings, valves, and the CRD accumulators within the RCPB) credit Water Chemistry Control-BWR and One-time Inspection AMPs for managing loss of material due to general, pitting, and crevice corrosion. The GALL Report does not have a line item for this material/environment/aging effect combination, except for the one Table 1 line item associated with the isolation condenser. Since the components addressed by this further evaluation in the LRA are exposed to reactor water similar to the isolation condenser, the staff found that these two AMPs are appropriate to manage the above aging effect associated with other RCPB components within the RCS. On this basis, the staff finds that applicant has met the criteria of SRP-LR Section 3.1.2.2.2, Item 2, for further evaluation.

(3) In LRA Section 3.1.2.2.2, Item 3, the applicant addressed loss of material due to general, pitting, and crevice corrosion in stainless steel, nickel-alloy and steel with stainless steel or nickel-alloy clad components of the reactor pressure vessel, and loss of material in stainless steel (including CASS) components of the RCPB exposed to reactor coolant. The applicant stated that this aging effect is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including areas of stagnant flow.

SRP-LR Section 3.1.2.2.2, Item 3, states that loss of material due to pitting and crevice corrosion could occur for stainless steel, nickel alloy, and steel with stainless steel or nickel alloy cladding flanges, nozzles, penetrations, pressure housings, safe ends, and vessel shells, heads and welds exposed to reactor coolant. The existing program relies on control of reactor water chemistry to mitigate corrosion. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended

function will be maintained during the period of extended operation.

The staff reviewed the applicant's One-Time Inspection Program and Water Chemistry Control-BWR Program and its evaluations are documented in SER Sections 3.0.3.1.6 and 3.0.3.1.10, respectively. The staff determined that the applicant's Water Chemistry Control-BWR Program is consistent with the recommendations in GALL Report, and will adequately manage loss of material due to pitting and crevice corrosion in stainless steel, nickel alloy, and steel with stainless steel or nickel alloy cladding flanges, nozzles, penetrations, pressure housings, safe ends, and vessel shells, heads and welds exposed to reactor coolant. The staff verified that the applicant's One-Time Inspection Program will be able to determine whether loss of material due to pitting or crevice corrosion in stagnant flow locations is progressing such that the component's intended function will be maintained during the period of extended operation. On this basis, the staff finds that applicant has met the criteria of SRP-LR Section 3.1.2.2.2, Item 3, for further evaluation.

(4) The applicant did not address loss of material due to general, pitting, and crevice corrosion in the steel PWR steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.2,Item 4, since this condition is applicable to pressurized water reactors (PWRs) only. The staff concluded that this aging effect is not applicable since JAFNPP is a BWR plant.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.1.2.2.2. For those line items that apply to LRA Section 3.1.2.2.2, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.3 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement

The staff reviewed LRA Section 3.1.2.2.3 against the SRP-LR Section 3.1.2.2.3 criteria.

(1) In LRA Section 3.1.2.2.3, Item 1, the applicant stated that neutron irradiation embrittlement is a TLAA evaluated for the period of extended operation in accordance with 10 CFR 54.21(c). The evaluation of loss of fracture toughness for the RV beltline shell and welds is discussed in SER Section 4.2.

SRP-LR Section 3.1.2.2.3, Item 1, states that 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) In LRA Section 3.1.2.2.3, Item 2, the applicant stated that the Reactor Vessel Surveillance Program manages reduction in fracture toughness due to neutron embrittlement of RV beltline materials. JAFNPP is a participant in the BWRVIP/ISP. This program monitors changes in the fracture toughness properties of ferritic materials in

the RPV beltline region.

SRP-LR Section 3.1.2.2.3, Item 2, states that loss of fracture toughness due to neutron irradiation embrittlement could occur in BWR and PWR RV beltline shell, nozzle, and welds exposed to reactor coolant and neutron flux. An RV materials surveillance program monitors neutron irradiation embrittlement of the RV. Reactor vessel surveillance program is plant-specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant is required to submit its proposed withdrawal schedule for approval prior to implementation. Untested capsules placed in storage must be maintained for future insertion. Thus, further staff evaluation is required for license renewal. Specific recommendations for an acceptable AMP are provided in GALL Report Chapter XI, Section M31.

The staff reviewed the applicant's Reactor Vessel Surveillance Program, and results of the staff's review are documented in SER Section 3.0.3.2.16. This program monitors neutron irradiation embrittlement of the RV.

Based on the program identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.1.2.2.3. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.1.2.2.4 criteria.

(1) In LRA Section 3.1.2.2.4, Item 1, the applicant stated that the Water Chemistry Control-BWR Program manages cracking due to SCC and IGSCC in the stainless steel vessel flange leak detection lines. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control-BWR Program. The One-Time Inspection Program will include the vessel flange leak off piping when determining an inspection sample representative of all JAFNPP small bore piping, and includes the use of volumetric examination for the detection of cracking.

SRP-LR Section 3.1.2.2.4, Item 1, states that cracking due to SCC and IGSCC could occur in the stainless steel and nickel alloy BWR top head enclosure vessel flange leak detection lines. The GALL Report recommends that a plant-specific AMP be evaluated because existing programs may not be capable of mitigating or detecting cracking due to SCC and IGSCC.

The staff reviewed the applicant's One-Time Inspection Program and Water Chemistry Control-BWR Program and its evaluations are documented in SER Sections 3.0.3.1.6 and 3.0.3.1.10, respectively. The staff determined that it will adequately manage the effects of stress corrosion cracking in the stainless steel vessel flange leak detection

line. Inspections performed by qualified personnel following a variety of NDE methods, including visual, volumetric, and surface techniques will identify any incipient defects in this small bore piping. On this basis, the staff finds that applicant has met the criteria of SRP-LR Section 3.1.2.2.4, Item 1, for further evaluation.

(2) In LRA Section 3.1.2.2.4, Item 2, the applicant stated that cracking due to SCC and IGSCC in stainless steel BWR isolation condenser components exposed to reactor coolant, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.4, is not applicable since JAFNPP does not have an isolation condenser.

On the basis that JAFNPP has no isolation condenser components, the staff finds this section not applicable to JAFNPP.

3.1.2.2.5 Crack Growth Due to Cyclic Loading

In LRA Section 3.1.2.2.5, the applicant stated that cracking due to cyclic loading of PWR vessel shells, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.5, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.5 against the criteria in SRP-LR Section 3.1.2.2.5 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.6 Loss of Fracture Toughness Due to Neutron Irradiation Embrittlement and Void Swelling

in LRA Section 3.1.2.2.6, the applicant stated that loss of fracture toughness of PWR reactor internals, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.6, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.6 against the criteria in SRP-LR Section 3.1.2.2.6 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.7 Cracking Due to Stress Corrosion Cracking

In LRA Section 3.1.2.2.7, the applicant stated that cracking due to SCC for PWR reactor flange leak detection lines made out of stainless steel, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.7.1, and for PWR Class 1 CASS piping, piping components, and piping elements, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.7.2 are applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.7 against the criteria in SRP-LR Section 3.1.2.2.7 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.8 Cracking Due to Cyclic Loading

The staff reviewed LRA Section 3.1.2.2.8 against the SRP-LR Section 3.1.2.2.8 criteria.

(1) In LRA Section 3.1.2.2.8, Item 1, the applicant stated that the paragraph in SRP-LR Section 3.1.2.2.8, Item 1,pertains to the jet pump sensing lines inside the RV. The lines inside the vessel do not form part of the RCS pressure boundary and their failure would not affect the performance of any functions within the scope of license renewal. At JAFNPP, these lines have no license renewal intended function and thus are not subject to an AMR. However, the lines outside the vessel are part of the RCS pressure boundary and hence are subject to an AMR.

SRP-LR Section 3.1.2.2.8, Item 1, states that cracking due to cyclic loading could occur in the stainless steel BWR jet pump sensing lines. The GALL Report recommends that a plant-specific AMP be evaluated to ensure that this aging effect is adequately managed.

The staff noted the LRA statements that jet pump flow is not a license renewal function and that the jet pump sensing lines inside the RPV are not parts of the RCPB. On the basis that the jet pump sensing lines have no license renewal function, the staff determines that no AMR for the jet pump sensing lines inside the RPV is required.

The staff noted that the applicant credits the Water Chemistry Control –BWR Program, Inservice Inspection Program, and One-Time Inspection Program as shown in LRA Table 3.1.1, item 3.1.1-48, for small-bore steel and stainless steel Class 1 piping, fittings, and branch connections less than 4-inches NPS exposed to reactor coolant.

The staff reviewed the AMPs and the evaluation is documented in SER Sections 3.0.3.1.10, 3.0.3.3.3, and 3.0.3.1.6, respectively. The staff finds that the aging effects for the jet pump sensing lines outside the reactor coolant pressure vessel are the same as for other small-bore stainless steel piping exposed to reactor coolant, and aging effects are managed by the AMPs as recommended in the GALL Report. On the basis, the staff finds this acceptable.

(2) In LRA Section 3.1.2.2.8, Item 2, the applicant stated that cracking due to cyclic loading in steel and stainless steel BWR isolation condenser components exposed to reactor coolant, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.8.2, is not applicable since JAFNPP does not have an isolation condenser.

The staff finds this section not applicable to JAFNPP because the plant has no isolation condenser components.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.1.2.2.8. For those line items that apply to LRA Section 3.1.2.2.8, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.9 Loss of Preload Due to Stress Relaxation

In LRA Section 3.1.2.2.9, the applicant stated that loss of preload due to stress relaxation of PWR reactor vessel internals (RVI) components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.9, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.9 against the criteria in SRP-LR Section 3.1.2.2.9 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.10 Loss of Material Due to Erosion

In LRA Section 3.1.2.2.10, the applicant stated that loss of material due to erosion of PWR steam generator components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.10, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.10 against the criteria in SRP-LR Section 3.1.2.2.10 and finds this section not applicable because JAFNPP is a BWR plant.

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. In LRA Section 3.1.2.2.11, the applicant addressed cracking due to flow-induced vibration in the stainless steel steam dryers. The applicant stated that this aging effect is managed by the BWR Vessel Internals Program. JAFNPP will evaluate BWRVIP-139 once it is approved by the staff and include its appropriate recommendations in the JAFNPP BWR Vessel Internals Program.

SRP-LR Section 3.1.2.2.11 states that cracking due to flow induced vibration could occur for the BWR stainless steel steam dryers exposed to reactor coolant. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

The staff reviewed the applicant’s BWR Vessel Internals Program and its evaluations are documented in SER Section 3.0.3.2.7. The staff determined that the BWR Vessel Internals AMP, with enhancements, performs periodic inspections of stainless steel steam dryers using UT or enhanced visual (EVT-1) examinations based on Information Notice 2002-26 and its supplements. The applicant's letter dated February 1, 2007, states that it has committed to enhance the BWR Vessel Internals Program to ensure that the effects of aging on the steam dryer are managed in accordance with the guidelines of BWRVIP-139 as approved by staff and accepted by the BWRVIP Executive Committee (Commitment No. 22). This provides reasonable assurance that the steam dryers will be appropriately managed by the BWR Vessel Internals AMP during the period of extended operation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.1.2.2.11. For those line items that apply to LRA Section 3.1.2.2.11, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.2.12 Cracking Due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking

In LRA Section 3.1.2.2.12, the applicant stated that cracking due to SCC and IASCC of PWR RVI components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.12, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.12 against the criteria in SRP-LR Section 3.1.2.2.12 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.13 Cracking Due to Primary Water Stress Corrosion Cracking

In LRA Section 3.1.2.2.13, the applicant stated that cracking due to primary water SCC of PWR components inside the RV, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.13, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.13 against the criteria in SRP-LR Section 3.1.2.2.13 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.14 Wall Thinning Due to Flow-Accelerated Corrosion

In LRA Section 3.1.2.2.14, the applicant stated that wall thinning due to flow-accelerated corrosion of PWR steam generator feedwater inlet ring and supports, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.14, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.14 against the criteria in SRP-LR Section 3.1.2.2.14

and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.15 Changes in Dimensions Due to Void Swelling

In LRA Section 3.1.2.2.15, the applicant stated that changes in dimensions due to void swelling of PWR RVI components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.15, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.15 against the criteria in SRP-LR Section 3.1.2.2.15 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.16 Cracking Due to Stress Corrosion Cracking and Primary Water Stress Corrosion Cracking

In LRA Section 3.1.2.2.16, the applicant indicated that cracking due to SCC and primary water SCC of PWR CRD penetration components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.16, Item 1, and PWR pressurizer head spray components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.16, Item 2, are applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.16 against the criteria in SRP-LR Section 3.1.2.2.16 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.17 Cracking Due to Stress Corrosion Cracking, Primary Water Stress Corrosion Cracking, and Irradiation-Assisted Stress Corrosion Cracking

In LRA Section 3.1.2.2.17, the applicant indicated that cracking due to SCC, primary water SCC, and IASCC of PWR RVI components, which is associated with the further evaluation in SRP-LR Section 3.1.2.2.17, is applicable to PWRs only.

The staff reviewed LRA Section 3.1.2.2.17 against the criteria in SRP-LR Section 3.1.2.2.17 and finds this section not applicable because JAFNPP is a BWR plant.

3.1.2.2.18 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 provides the staff's evaluation of the applicant's QA program.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report, for which the applicant has claimed consistency with the GALL Report and for which the GALL Report recommends further evaluation, the staff determined that the applicant has adequately addressed the issues further evaluated. 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 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.1.2-1 through 3.1.2-3, the staff reviewed additional details concerning the results of the AMRs for material, environment, AERM, and AMP combinations that are not consistent with the GALL Report, or that are 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 concerning how the aging effects will be managed. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of

extended operation. The staff's evaluation is discussed in the following sections.

3.1.2.3.1 Reactor Vessel Summary of Aging Management Evaluation - LRA Table 3.1.2-1

The staff reviewed LRA Table 3.1.2-1, which summarizes the results of AMR evaluations for the RV component groups.

The staff noted that LRA Table 3.1.2-1 includes an AMR line item to address cracking of the CRD return line nozzle cap in the RV system. The cap material used for this component is Inconel 600. The AMR line item cites Generic Note F, which indicates that this material is not in the GALL Report for this component. The applicant has credited the BWR CRD Return Line Nozzle and Water Chemistry Control-BWR Programs to manage cracking due to SCC and IGSCC. The staff reviewed the Water Chemistry Control-BWR Program and confirmed that it includes activities to maintain an acceptable level of water purity in the CRD return line nozzle, which will minimize the susceptibility of this component to cracking. In addition, the staff reviewed the BWR CRD Return Line Nozzle Program and confirmed that periodic volumetric examination of this nozzle cap weld to the low-alloy steel nozzle will provide timely detection of any degradation of this component. Thus, the structural and pressure boundary integrity of the RPV will be maintained during the period of extended operation. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.1.2-1 includes several AMR line items to address low-alloy steel or carbon steel external surfaces of vessel components in the RV system exposed to air-indoor (external). The AMR results state that there are no aging mechanisms or effects for these material/environment combinations, since these surfaces are at high temperature (above 200 °C) thus precluding any moisture accumulation that could result in corrosion. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff noted that the low-alloy steel or carbon steel external surfaces of vessel components (*i.e.,* CRD stub tubes, nozzles, nozzle flanges, nozzle safe ends, RV bottom head, RV shell, RV upper head) are exposed to a high normal operating temperature preventing any moisture accumulation that could result in corrosion. On the basis that the component's high surface temperature precludes the corrosion of low-alloy steel, the staff concludes that there are no applicable AERMs for these components exposed to an to air-indoor (external) environment.

The staff noted that LRA Table 3.1.2-1 includes an AMR line item to address loss of material of low-alloy steel RV external attachments (*i.e.,* stabilizer brackets and support skirt) in the RV system exposed to controlled air-indoor (external). The AMR line item credits the Inservice Inspection Program to manage this aging effect. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material and environment combination. The staff reviewed the applicant's Inservice Inspection Program and its evaluations are documented in SER Section 3.0.3.3.3. The staff confirmed that it includes activities that are adequate to detect any corrosion on the external surface of these components.

During the audit and review, the staff asked the applicant to discuss the specific activities that will be performed to manage this aging effect. In its response, the applicant stated that surface examination using NDE techniques specified in ASME Code Section XI, Subsection IWB,

Table IWB-2500-1, Category B-K will be used with a sample size of 100% each 10-year inservice interval. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.1.2-1 includes an AMR line item to address loss of material of high-strength low-alloy steel vessel flange closure studs, nuts, washers and bushings in the RV system exposed to controlled air-indoor (external). The AMR line item credits the Reactor Head Closure Stud Program to manage this aging effect. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material and environment combination. The staff reviewed the applicant's Reactor Head Closure Stud Program and its evaluations are documented in SER Section 3.0.3.2.15. The RV Closure Studs Program is listed GALL Report Section XI.M3 as a valid AMP for managing age-related effects in RV closure studs, nuts, washers and bushings. The staff confirmed that the applicant's Reactor Head Closure Stud Program includes activities that are adequate to detect any corrosion of stud external surface or flange. On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.2 Reactor Vessel Internals Summary of Aging Management Evaluation - LRA Table 3.1.2-2

The staff reviewed LRA Table 3.1.2-2, which summarizes the results of AMR evaluations for the RVI component groups.

The staff noted that LRA Table 3.1.2-2 includes an AMR line item to address loss of preload of core support rim bolts in the RVI system as a TLAA. The AMR line item cites Generic Note H, which indicates that this aging effect is not in the GALL Report for this component, material and environment combination.

The staff reviewed Note H and evaluated the aging effect due to IGSCC in the core plate hold-down bolts that are listed in LRA Table 3.1.2-2 against the criteria in SRP-LR Section 3.1.2.2. The staff's evaluation is addressed in the following sections.

The applicant implemented the BWR Vessel Internals Program for managing the aging effects due to loss of preload and cracking in these bolts. The BWR Vessel Internals Program in turn invokes the inspection guidelines that are specified in the BWRVIP-25 Report, "BWR Core Plate Inspection and Flaw Evaluation Guidelines." BWRVIP-25 Report Table 3.1.2-2 recommends that if wedges are not-installed, the core support rim bolts should be inspected for cracks using enhanced visual testing (EVT-1) from below the core plate or UT from above the core plate if an effective UT technique is developed.

Since wedges are not currently installed at JAFNPP, the staff requested in RAI 3.1.2-2B dated January 12, 2007, that the applicant provide information regarding the type of inspection methods, inspection frequency and the results of the inspections that have been performed

thus far on core support rim bolts.

In its response dated February 12, 2007, the applicant revised LRA Tables 2.3.1-2 and 3.1.2-2 to use the phrase “core plate hold-down bolts” in lieu of “core support rim bolts” to maintain consistency in nomenclature.

GALL Report, Volume 2, Revision 1, Item IV.B1-6, recommends GALL AMPs XI.M2, “Water Chemistry,” and XI.M9, “BWR Vessel Internals,” for monitoring the aging effect due to IGSCC in core plate hold-down bolts. Consistent with these requirements, the applicant proposed to implement the Water Chemistry Control-BWR Program and the BWR Vessel Internals Program for monitoring the aging degradation of the stainless steel core plate hold-down bolts at JAFNPP.

The Water Chemistry Control-BWR Program provides adequate control of reactor coolant system (RCS) water chemistry. The BWR Vessel Internals Program invokes the inspection requirements specified in the American Society of Mechanical Engineers (ASME) Code Section XI, Inservice Inspection Program, which mandates implementation of periodic inspections and inspection methods for certain reactor vessel internals components. In addition, the core plate hold-down bolts are inspected per the BWRVIP-25 Report, “BWR Core Plate Inspection and Flaw Evaluation Guidelines,” which requires inspections which are complimentary to the ASME Code ISI. In the BWR Vessel Internals Program, the applicant stated that it will inspect the core plate hold-down bolts per the applicable BWRVIP inspection guidelines for the current inspection period in lieu of the ASME Code ISI requirements after obtaining staff’s approval. If the applicant decides to implement the relevant BWRVIP inspection guidelines in lieu of the ASME Code ISI requirements for monitoring the aging degradation of the reactor vessel internals components during the license renewal period, it must obtain NRC’s approval under the provisions of 10 CFR 50.55a.

In RAI 3.1.2-2A dated January 12, 2007, the staff also requested that if the applicant does not plan to install seismic wedges, it should provide information regarding the accessibility for performing the inspections, type of inspections including UT technique, and inspection frequency that will be used to monitor the aging degradation in the core plate hold-down bolts during the license renewal period.

In its response dated February 12, 2007, to the staff’s RAI 3.1.2-2A, the applicant states:

> During RO11 in December 1994, twenty core plate hold-down bolts were examined by visual inspection (VT-1). The bolts were examined from the top side of the core plate. All examined bolts showed that the weld keeper used as a nut lock remained fillet welded to the top of the bolt. The pertinent plant drawing shows that this is typical for all 72 bolt locations.
>
> During RO13 in October-November 1998, all 72 core plate hold-down bolts were examined by visual inspection (VT-3) from the top side of the core plate. This inspection again showed the nut lock welded to the top of each bolt.
>
> As described in the response to RAI 4.7.3.2-1 below, JAFNPP will perform one of the following.

1. Install core plate wedges prior to the period of extended operation, or

2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate rim hold down bolting in accordance with BWRVIP-25 and submit the inspection plan to the NRC two years prior to the period of extended operation for NRC review and approval, or

3. Perform inspection of core plate rim hold down bolts in accordance with ASME Code Section XI or in accordance with an NRC-approved version of BWRVIP-25.

If Option 2 is selected, the analysis to determine acceptance criteria will address the information requested in RAIs 3.1.2-2A and 4.7.3.2-1.

License renewal commitment 23 (JAFP-07-0021 letter dated 02/12/2007) specifies this commitment.

With regards to RAI 3.1.2-2A, the staff finds the applicant's response acceptable, pending the resolution of license renewal Commitment No. 23. Therefore, the staff's concern described in RAI 3.1.2-2A is resolved.

The staff also noted that BWRVIP-25 Report Table 3-2 addresses inspection strategy for the core plate hold-down bolts. However, in LRA Table 3.1.2-2, the applicant identifies them as core support rim bolts.

In RAI 3.1.2-2B dated January 12, 2007, the staff requested that the applicant revise LRA Table 3.1.2-2 to include core plate hold-down bolts in lieu of core support rim bolts to maintain consistency in nomenclature.

In its response dated 02/12/2007, to RAI 3.1.2-2B, the applicant proposed to revise LRA Tables 2.3.1-2 and 3.1.2-2 for consistent use of the term "core plate hold-down bolts." The staff found this editorial change acceptable. Therefore, the staff's concern described in RAI 3.1.2-2B is resolved.

Consistent with the requirements specified in GALL Report Table IV.B1-15, in LRA Table 3.1.2-2 the applicant stated that loss of material due to corrosion of the core plate hold-down bolts would be monitored by implementing the Water Chemistry Control-BWR Program. In addition, the applicant stated that an augmented one-time inspection program, which is not a GALL requirement, will be implemented to verify the effectiveness of the Water Chemistry Control-BWR Program. Since the applicant complied with the requirements specified in GALL Report Table IV.B1-15, the staff found that loss of material in the core plate hold-down bolts due to corrosion is adequately managed by the Water Chemistry Control-BWR Program and the augmented One-Time Inspection Program. The staff, however, reiterates that the applicant shall conform to any conditions that are imposed in the section of the SE related to the Water Chemistry Control-BWR Program.

The staff reviewed LRA Table 3.1.2-2 which addressed loss of preload as an aging effect in the core plate hold-down bolts and the staff's review is stated below.

The core plate hold-down bolts are subject to stress relaxation due to thermal and irradiation effects and, consequently, they would experience five to nineteen percent loss of preload. The applicant identified that loss of preload in core plate hold-down bolts is a TLAA issue. The applicant, in LRA Section 4.7.3.2 stated that it would comply with the guidelines specified in the BWRVIP-25 Report which includes inspection criteria for the core plate hold-down bolts. The applicant also stated that it would either install seismic wedges or perform a plant-specific analysis that meets the requirements of the BWRVIP-25 Report. If the applicant chooses to install seismic wedges, the core plate hold-down bolts are excluded from the BWRVIP-25 inspection guidelines. On this basis, the staff finds the AMR results for this line item acceptable. Details of the staff's review related to this TLAA issue are addressed in SER Section 4.7.3.2.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.1.2.3.3 Reactor Coolant Pressure Boundary Summary of Aging Management Evaluation – LRA Table 3.1.2-3

The staff reviewed LRA Table 3.1.2-3, which summarizes the results of AMR evaluations for the RCPB system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs and AMP combinations that are not evaluated in the GALL Report.

Conclusion. On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations 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 RV, internals, and RCS components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2 Aging Management of Engineered Safety Features Systems

This section of the SER documents the staff's review of the applicant's AMR results for the engineered safety features systems components and component groups of the following:

- residual heat removal (RHR)
- core spray
- automatic depressurization (ADS)
- high pressure coolant injection (HPCI)

- reactor core isolation cooling (RCIC)
- standby gas treatment (SGT)
- primary containment penetrations (PCP)

3.2.1 Summary of Technical Information in the Application

In LRA Section 3.2, the applicant provided AMR results for the engineered safety features systems components and component groups. In LRA Table 3.2.1, "Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the engineered safety features systems components and component groups.

In LRA Tables 3.2.2-1 through 3.2.2-7, the applicant provided a summary of the AMR results for component types associated with (1) RHR system, (2) core spray system, (3) ADS, (4) HPCI system, (5) RCIC system, (6) SGT system, and (7) PCP.

In LRA Tables 3.3.2-14-1 to 4, 3.3.2-14-7, 3.3.2-14-8, 3.3.2-14-10, and 3.3.2-14-14, the applicant provided results for component types associated with the engineered safety features (ESFs).

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.2.2 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 systems components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's audit evaluation are summarized in SER Section 3.2.2.1.

In the onsite audit, the staff also selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.2.2.2. The staff's audit evaluations are summarized in SER Section 3.2.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and whether the aging effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are summarized in SER Section 3.2.2.3. The staff's evaluation of the technical review is also documented in SER Section 3.2.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the engineered safety features systems components.

Table 3.2-1, provided below, includes a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.2, that are addressed in the GALL Report.

Table 3.2-1 Staff Evaluation for Engineered Safety Features Systems Components in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel and stainless steel piping, piping components, and piping elements in emergency core cooling system (3.2.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.2.2.2.1)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.2.1-2)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks"	Not Applicable	Not applicable to BWRs (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	Water Chemistry Control - BWR (B.1.29.2), and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.3, Item 1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to soil (3.2.1-4)	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Buried Piping and Tanks Inspection (B.1.1)	Consistent with GALL which recommends further evaluation (See SER Section 3.2.2.2.3, Item 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	Water Chemistry Control - BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.3, Item 3)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil (3.2.1-6)	Loss of material due to pitting and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis Program (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation(See SER Section 3.2.2.2.3, Item 4)
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.	None	Not applicable(See SER Section 3.2.2.2.3, Item 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.	One-time inspection (B.1.21)	Consistent with GALL which recommends further evaluation (See SER Section 3.2.2.2.3, Item 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	Oil Analysis Program (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.4, Item 1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel heat exchanger tubes exposed to treated water (3.2.1-10)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.4, Item 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.	None	Not applicable (See SER Section 3.2.2.2.5)
Stainless steel high-pressure safety injection (charging) pump miniflow orifice exposed to treated borated water (3.2.1-12)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging.	Not Applicable	Not applicable to BWRs (See SER Section 3.2.2.2.6)
Steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled (internal) (3.2.1-13)	Loss of material due to general corrosion and fouling	A plant-specific aging management program is to be evaluated.	Not applicable	Not applicable(See SER Section 3.2.2.2.7)
Steel piping, piping components, and piping elements exposed to treated water (3.2.1-14)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR (B.1.29.2); and either One-Time Inspection (B.1.21) or Periodic Surveillance and Preventive Maintenance program (B.1.22)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.8, Item 1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel containment isolation piping, piping components, and piping elements internal surfaces exposed to treated water (3.2.1-15)	Loss of material due to general, pitting, and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.8, Item 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	Oil Analysis Program (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.8, Item 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 microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection (B.1.1)	Consistent with GALL Report which recommends further evaluation (See SER Section 3.2.2.2.9)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.2.1-18)	Cracking due to stress corrosion cracking and intergranular stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.1)
Steel piping, piping components, and piping elements exposed to steam or treated water (3.2.1-19)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion (B.1.14); or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.2)
Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated or unborated) > 250°C (> 482°F) (3.2.1-20)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	Not applicable	Not applicable (See SER Section 3.2.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
High-strength steel closure bolting exposed to air with steam or water leakage (3.2.1-21)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
Steel closure bolting exposed to air with steam or water leakage (3.2.1-22)	Loss of material due to general corrosion	Bolting Integrity	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
Steel bolting and closure bolting exposed to air - outdoor (external), or air - indoor uncontrolled (external) (3.2.1-23)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	Bolting Integrity (B.1.12)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Steel closure bolting exposed to air - indoor uncontrolled (external) (3.2.1-24)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity (B.1.12)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.3)
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water > 60°C (> 140°F) (3.2.1-25)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
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	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
Steel heat exchanger components exposed to closed cycle cooling water (3.2.1-27)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed-cycle cooling water (3.2.1-28)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1).
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.2.1-29)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Stainless steel and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.2.1-30)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
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	External Surfaces Monitoring (B.1.11)	Consistent with GALL Report (See SER Section 3.2.2.1)
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	External Surfaces Monitoring (B.1.11) Fire Protection-Fire Water System (B.1.13.2) One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
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	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
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	One-Time Inspection (B.1.21) Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.5)
Steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-35)	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.6)
Steel heat exchanger components exposed to raw water (3.2.1-36)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically - influenced corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26) or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.7)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.2.1-37)	Loss of material due to pitting, crevice, and microbiologically - influenced corrosion	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.7)
Stainless steel containment isolation piping and components internal surfaces exposed to raw water (3.2.1-38)	Loss of material due to pitting, crevice, and microbiologically - influenced corrosion, and fouling	Open-Cycle Cooling Water System	Not Applicable	Not applicable (See SER Section 3.2.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel heat exchanger components exposed to raw water (3.2.1-39)	Loss of material due to pitting, crevice, and microbiologically - influenced corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1.7)
Steel and stainless steel heat exchanger tubes (serviced by open-cycle cooling water) exposed to raw water (3.2.1-40)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
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	Selective Leaching (B.1.25)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Gray cast iron piping, piping components, piping elements exposed to closed-cycle cooling water (3.2.1-42)	Loss of material due to selective leaching	Selective Leaching of Materials	Selective Leaching (B.1.25)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.2.2.1)
Gray cast iron piping, piping components, and piping elements exposed to soil (3.2.1-43)	Loss of material due to selective leaching	Selective Leaching of Materials	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
Gray cast iron motor cooler exposed to treated water (3.2.1-44)	Loss of material due to selective leaching	Selective Leaching of Materials	Not applicable	Not applicable (See SER Section 3.2.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
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	Not Applicable	Not applicable to BWRs
Steel encapsulation components exposed to air with borated water leakage (internal) (3.2.1-46)	Loss of material due to general, pitting, crevice and boric acid corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not Applicable	Not applicable to BWRs
Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated borated water > 250°C (> 482°F) (3.2.1-47)	Loss of fracture toughness due to thermal aging embrittlement	Thermal Aging Embrittlement of CASS	Not Applicable	Not applicable to BWRs
Stainless steel or stainless-steel-clad steel piping, piping components, piping elements, and tanks (including safety injection tanks/accumulators) exposed to treated borated water > 60°C (> 140°F) (3.2.1-48)	Cracking due to stress corrosion cracking	Water Chemistry	Not Applicable	Not applicable to BWRs
Stainless steel piping, piping components, piping elements, and tanks exposed to treated borated water (3.2.1-49)	Loss of material due to pitting and crevice corrosion	Water Chemistry	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Aluminum piping, piping components, and piping elements exposed to air - indoor uncontrolled (internal/external) (3.2.1-50)	None	None	None	Consistent with GALL Report
Galvanized steel ducting exposed to air - indoor controlled (external) (3.2.1-51)	None	None	Not Applicable	Not Applicable (See SER Section 3.2.2.1.8)
Glass piping elements exposed to air - indoor uncontrolled (external), lubricating oil, raw water, treated water, or treated borated water (3.2.1-52)	None	None	None	Consistent with GALL Report
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.2.1-53)	None	None	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.2.1-54)	None	None	Not applicable	Not applicable (See SER Section 3.2.2.1.8)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.2.1-55)	None	None	Not applicable	Not applicable (See SER Section 3.2.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, stainless steel, and copper alloy piping, piping components, and piping elements exposed to gas (3.2.1-56)	None	None	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	Not Applicable	Not applicable to BWRs

The staff's review of the engineered safety features systems component groups followed one of several approaches. One approach, documented in SER Section 3.2.2.1, discusses the staff's review of the AMR results for components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in SER Section 3.2.2.2, discusses the staff's review of the 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, discusses the staff's review of the 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 that are credited to manage or monitor aging effects of the engineered safety features systems components is documented in SER Section 3.0.3.

3.2.2.1 AMR Results That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.2.2.1, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the effects of aging related to the engineered safety features systems components:

- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- Flow-Accelerated Corrosion Program
- Heat Exchanger Monitoring Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Selective Leaching Program
- Service Water Integrity Program

- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program
- Bolting Integrity Program

In LRA Tables 3.2.2-1 through 3.2.2-7, 3.3.2-14-1 through 3.2.2-14- 4, 3.3.2-14-7, 3.3.2-14-8, 3.3.2-14-10, and 3.3.2-14-14, the applicant provided a summary of AMRs for the engineered safety features systems components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes describe how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E, which indicate that 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report and the 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant is consistent with the AMP identified in the GALL Report 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 AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report that has the same material, environment, aging effect, and AMP as the component that was 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 AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted

by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report 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 a different AMP is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit and review of the information provided in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation is discussed below.

3.2.2.1.1 Cracking due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

LRA Table 3.2.1, Item 3.2.1-18, addresses cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC) for stainless steel piping, piping components, and piping elements exposed to treated water >60ºC (>140ºF) in the ESF systems. The LRA credits the Water Chemistry Control-BWR Program together with the One-Time Inspection Program. GALL Report recommends AMPs XI.M7, "BWR Stress Corrosion Cracking," and the XI.M2, "Water Chemistry," to manage this aging effect. The LRA states that none of the ESF system components are within the scope of the BWR Stress Corrosion Cracking Program. The AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 cite Generic Note E, indicating that the AMR line items are consistent with NUREG-1801 material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicant's One-Time Inspection Program and Water Chemistry Control-BWR Program and its evaluations are documented in SER Sections 3.0.3.1.6 and 3.0.3.1.10, respectively. The staff determined that Water Chemistry Control-BWR Program include activities that are consistent with the recommendations in the GALL AMP X.M2 to maintain high water purity, which is effective for managing cracking due to SCC and IGSCC for stainless steel components exposed to treated water. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the applicant's Water Chemistry Control-BWR Program to manage cracking.

During the audit and review, the staff also asked the applicant for additional information on the components addressed by this AMR and why they are not within the scope of the BWR SCC Program. In its response, the applicant stated that the BWR SCC Program is applicable to all BWR piping and piping welds made of austenitic stainless steel and nickel alloy that are 4 inches or larger NPS, and contain reactor coolant at a temperature above 93ºC (200ºF) during power operation. The components addressed by this AMR line items are less than 4 inches NPS and are outside the reactor coolant system pressure boundary; therefore, they are outside the scope of the BWR SCC Program. The applicant also stated that the components addressed by this AMR line item are included within the scope of the JAFNPP Inservice Inspection Program.

The staff reviewed the applicant's BWR SCC Program and its evaluation is documented in SER Section 3.0.3.2.5. The staff determined that the components addressed by this AMR line item are outside the scope of the BWR SCC Program. Since they are included in the Inservice Inspection Program, they will be inspected periodically, which will ensure that any cracking will be detected and corrective actions taken. The staff also reviewed GALL AMP XI.M7 and determined that it includes water chemistry control along with inservice inspections to manage SCC and IGSCC. Since the applicant is crediting the Water Chemistry Control-BWR Program, and the components are within the scope of the ISI Program, the staff finds that the activities being credited are consistent with the GALL Report recommendations to manage these aging effects. On this basis, the staff finds the AMR results for this line item acceptable.

3.2.2.1.2 Wall Thinning due to Flow-Accelerated Corrosion

LRA Table 3.2.1, Item 3.2.1-19, addresses wall thinning due to flow-accelerated corrosion for steel piping, piping components, and piping elements exposed to steam or treated water in the ESF systems. The LRA credits the Flow-Accelerated Corrosion (FAC) Program, or the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. GALL Report recommends GALL AMP XI.M17, "Flow-Accelerated Corrosion," to manage this aging effect. The AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 credit the Periodic Surveillance and Preventive Maintenance Program and cite Generic Note E, indicating that the AMR line items are consistent with NUREG-1801 material, environment, and aging effect, but a different aging management program is credited.

During the audit and review, the staff asked the applicant to clarify why the Periodic Surveillance and Preventive Maintenance Program is credited for some components addressed by this AMR instead of the FAC Program. In its response, the applicant stated that augmented inspections are performed at JAFNPP on selected piping components that are not part of the inspections required by applicant's Generic Letter 89-08 program, which are performed under the GALL AMP XI.M17 Program. These inspections are the same as those performed under the FAC Program, but are included in the Periodic Surveillance and Preventive Maintenance Program for administrative reasons since the aging effect is not FAC.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and determined that this aging management program includes measurement of wall thickness for the RCIC piping to detect loss of material due to erosion. This is the same activity that would be performed under the FAC program, and acceptance criteria are established in accordance with the FAC Program. Since these inspections are the same as those performed under the FAC Program, the activities are consistent with the recommendations in GALL AMP XI.M17 to manage wall thinning due to flow-accelerated corrosion for steel components exposed to steam or treated water. On this basis, the staff finds the AMR results for this line item acceptable.

3.2.2.1.3 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

LRA Table 3.2.1, Item 3.2.1-24, addresses loss of preload due to thermal effects, gasket creep, and self-loosening for steel closure bolting exposed to air-indoor uncontrolled (external) in the ESF systems. The LRA states that this aging effect is not applicable since loss of preload is a design driven effect and not an aging effect requiring management. GALL Report recommends

AMP XI.M18, "Bolting Integrity," to manage this aging effect.

During the audit and review, the staff asked the applicant to clarify why this aging effect is not applicable at JAFNPP. In its response, the applicant stated that this position is consistent with the EPRI Mechanical Tools report (EPRI 1010639); however, the bolting integrity program is currently used at JAFNPP to monitor these components. The applicant committed to amend the LRA to delete “Not Applicable” from this AMR line item.

In its letter dated February 1, 2007, the applicant amended the LRA to delete “Not Applicable” from this AMR line item. The staff reviewed the applicant’s bolting integrity program and determined that it is consistent with the recommendations in GALL AMP XI.M18, and includes activities that will manage loss of preload for these components. On this basis, the staff finds this AMR acceptable.

3.2.2.1.4 Loss of Material due to General Corrosion

LRA Table 3.2.1, Item 3.2.1-32, addresses loss of material due to general corrosion for steel piping and ducting components, and internal surfaces exposed to air-indoor uncontrolled (internal) in the ESF systems. The LRA credits the External Surfaces Monitoring Program, Fire Protection Program, Fire Water System Program, or the One-Time Inspection Program to manage this aging effect. GALL Report recommends AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to manage this aging effect. The AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited.

GALL AMP XI.M38 includes periodic visual inspections of internal surfaces of components that are not included in other aging management programs for loss of material. The inspections are performed when the internal surfaces are accessible during the performance of periodic surveillances, during maintenance activities, or during scheduled outages. The staff reviewed the applicant’s External Surfaces Monitoring Program, Fire Protection Program, Fire Water System Program, and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.2.9, 3.0.3.2.11, 3.0.3.2.12, and 3.0.3.1.6, respectively. The staff finds that the applicant’s External Surfaces Monitoring Program includes inspections of external surfaces that are appropriate for managing loss of material from internal surfaces when the internal and external material and environment combinations are the same, such that external surface condition is representative of internal surface condition. The applicant’s Fire Protection Program and Fire Water System Program include tests and inspections of fire protection equipment that will detect loss of material due to corrosion. The staff determined that the One-Time Inspection Program is credited for managing loss of material for piping in the radwaste and plant drains system, which is not continuously wetted and for which aging due to corrosion is not anticipated to be significant. The staff finds this acceptable since the one-time inspection will confirm that no significant corrosion is occurring in these components. On the basis of its review, the staff determined that the applicant’s External Surfaces Monitoring Program, Fire Protection Program, Fire Water System program, and One-Time Inspection Program include inspections that provide the same level of assurance for managing loss of material as GALL AMP XI.M38 program, and are adequate to manage loss of material due to general corrosion for steel components exposed to air-indoor uncontrolled for the components addressed by this AMR. On

this basis, the staff finds the AMR results for this line item acceptable.

3.2.2.1.5 Loss of Material due to General, Pitting, and Crevice Corrosion

LRA Table 3.2.1, Item 3.2.1-34, addresses loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to condensation (internal) in the ESF systems. The LRA credits the One-Time Inspection Program or the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. GALL Report recommends AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to manage this aging effect. The AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicant's One-Time Inspection Program and Periodic Surveillance and Preventive Maintenance Program and its evaluations are documented in SER Sections 3.0.3.1.6 and 3.0.3.3.4, respectively. The staff determined that these aging management programs which include inspections of internal surfaces consistent with GALL AMP XI.M38 that are adequate to manage loss of material for the components addressed by this AMR. The staff determined that the Periodic Surveillance and Preventive Maintenance Program includes periodic inspections that are performed as part of routine plant surveillance and preventive maintenance activities. These inspections will detect loss of material on the internal surfaces of piping and piping components in a timely manner such that corrective actions can be taken prior to a loss of component intended function. The staff also determined that the One-Time Inspection Program is credited for components in the high pressure coolant injection system that are exposed to untreated air that may contain moisture. Loss of material is not expected to be a significant aging effect for these components since they are not continuously exposed to moisture. Therefore, the staff considers the One-Time Inspection Program adequate to verify the absence of this aging effect for these components. On this basis, the staff finds the AMR results for this line item acceptable.

3.2.2.1.6 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling

LRA Table 3.2.1, Item 3.2.1-35, addresses loss of material due to general, pitting, crevice, and MIC, and fouling for steel containment isolation piping and components internal surfaces exposed to raw water in the ESF systems. The LRA credits the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. GALL Report recommends GALL AMP XI.M20, "Open-Cycle Cooling Water System," to manage this aging effect. The AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different aging management program is credited.

During the audit and review, the staff asked the applicant to clarify why this AMR line item does not credit applicant's Service Water Integrity Program for these components. In its response, the applicant stated that the components addressed in this AMR line item are in containment isolation penetrations for drains from the drywell floor and equipment sumps. As such, the internal raw water environment for the components is drainage from containment, which is not

the raw lake-water. Therefore, these components are not within the scope of the Service Water Integrity Program.

The staff determined that the components addressed by this AMR line item are not within the scope of the Service Water Integrity Program since they are not exposed to raw service water. The staff also determined that, since these components are intermittently exposed to drainage water only, loss of material will not be as severe as for components continuously exposed to service water.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this aging management program includes periodic inspections consistent with GALL AMP XI.M20, that will detect loss of material in a timely manner such that corrective actions can be taken prior to a loss of component intended function. As such, the staff finds the applicant's Periodic Surveillance and Preventive Maintenance Program adequate to manage loss of material for the components addressed by this AMR line item. On this basis, the staff finds this AMR results for this line item acceptable.

3.2.2.1.7 Loss of Material due to General, Pitting, Crevice, Galvanic, and Microbiologically-Influenced Corrosion, and Fouling

LRA Table 3.2.1, Item 3.2.1-36, addresses loss of material due to general, pitting, crevice, galvanic, and MIC, and fouling for steel heat exchanger components exposed to raw water in the ESF systems. The LRA credits the Service Water Integrity Program or Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. GALL Report recommends AMP XI.M20, "Open-Cycle Cooling Water System," to manage this aging effect. The AMR line items in LRA Table 2 that reference this line item in GALL Report Table 1 and credit the Periodic Surveillance and Preventive Maintenance Program cite Generic Note E, indicating that the AMR line items are consistent with NUREG-1801 material, environment, and aging effect, but a different aging management program is credited.

During the audit and review, the staff asked the applicant to clarify why the AMR line items do not credit applicant's Service Water Integrity Program for these components. In its response, the applicant stated that the components addressed in this AMR line item are in the standby gas treatment system and are drains for water accumulation or condensation from the various components in the system. As such, the internal raw water environment for the components is condensation or drainage, which is not the raw lake-water used in the service water systems. Therefore, these components are not within the scope of the Service Water Integrity Program.

The staff determined that the components addressed by this AMR line item are not within the scope of the Service Water Integrity Program since they are not exposed to raw service water. The staff also determined that, since these components are intermittently exposed to drainage water only, loss of material will not be as severe as for components continuously exposed to service water. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this Aging Management Program includes periodic inspections consistent with GALL AMP XI.M20, that will detect loss of material in a timely manner such that corrective actions can be taken prior to a loss of component intended function. As such, the staff finds the

Periodic Surveillance and Preventive Maintenance Program adequate to manage loss of material for the components addressed in this AMR. On this basis, the staff finds the AMR results for this line item acceptable.

3.2.2.1.8 AMR Results Identified as Not Applicable

In LRA Table 3.2.1, line Items 20, 21, 22, 26, 30, 33, 38, 43, 44, 51, 54, 55, and 57 are identified as “Not Applicable” since the component/material/ environment combination does not exist at JAFNPP or a different GALL Report Table 1 AMR line item was credited to manage the aging effect. For each of these line items, the staff reviewed the LRA and the applicant’s supporting documents, and confirmed the applicant’s claim that the component/material/environment combination does not exist at JAFNPP or the Table 1 AMR line item credited is acceptable.

On the basis that JAFNPP does not have the component/material/ environment combination for these GALL Report Table 1 line items, the staff finds that these AMR line items are not applicable to JAFNPP.

Conclusion. The staff evaluated the applicant’s claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant’s consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.2.2.2, the applicant provided further evaluation of aging management, as recommended by the GALL Report, for the engineered safety features systems components. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to cladding
- loss of material due to pitting and crevice corrosion
- reduction of heat transfer due to fouling
- hardening and loss of strength due to elastomer degradation
- loss of material due to erosion
- loss of material due to general corrosion and fouling

- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion
- QA for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL 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 3.2.2.2. The staff's evaluation of the aging effects is discussed in the following sections.

3.2.2.2.1 Cumulative Fatigue Damage

The staff reviewed LRA Section 3.2.2.2.1 against the SRP-LR Section 3.2.2.2.1 criteria.

SRP-LR Section 3.2.2.2.1states that fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of SRP-LR.

SER Section 4.3.2.2 documents the staff's review of the applicant's evaluation of this TLAA for Non-Class 1 components, including non-class 1 portions of the emergency safety features systems.

3.2.2.2.2 Loss of Material Due to Cladding Breach

SRP-LR Section 3.2.2.2.2 addresses loss of material due to cladding breach for PWR steel pump casings with stainless steel cladding exposed to treated borated water. This further evaluation is not applicable since JAFNPP is a BWR plant.

On the basis that JAFNPP does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at JAFNPP.

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 SRP-LR Section 3.2.2.2.3 criteria.

(1) In LRA Section 3.2.2.2.3, Item 1, the applicant addressed loss of material due to pitting and crevice corrosion for internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. The applicant stated that this aging effect is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.2.2.2.3, Item 1, states that loss of material due to pitting and crevice corrosion could occur for internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP relies on monitoring and control of water chemistry to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with recommendations in GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion for internal surfaces of stainless steel containment isolation piping, piping components, and piping elements exposed to treated water. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3, Item 1, for further evaluation.

(2) In LRA Section 3.2.2.2.3, Item 2, the applicant addressed loss of material from pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil. The applicant stated that this aging effect is managed by the Buried Piping and Tanks Inspection Program. The Buried Piping and Tanks Inspection Program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, copper alloy, gray cast iron, and stainless steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

SRP-LR Section 3.2.2.2.3, Item 2, states that loss of material from 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 the aging effect is adequately managed.

The staff reviewed the applicant's Buried Piping and Tanks Inspection Program and its evaluation is documented in SER Section 3.0.3.2.1. The staff determined that this program includes activities that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material from pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil. The staff confirmed that inspections will be performed both during the 10-year period immediately prior to the period of extended operation, as well as during the 10-year period after entering the period of extended operation, as recommended in GALL Report. On this basis, the staff finds that the applicant has met the criteria of SRP-LR

Section 3.2.2.2.3, Item 2, for further evaluation.

(3) In LRA Section 3.2.2.2.3, Item 3, the applicant addressed loss of material from pitting and crevice corrosion for BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water. The applicant stated that this aging effect is managed by the Water Chemistry Control – BWR Program for stainless steel components. There are no aluminum components exposed to treated water in the ESF systems. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.2.2.2.3, Item 3, states that loss of material from pitting and crevice corrosion could occur for BWR stainless steel and aluminum piping, piping components, and piping elements exposed to treated water. The existing AMP relies on monitoring and control of water chemistry for BWRs to mitigate degradation. However, control of water chemistry does not preclude loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the water chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material from pitting and crevice corrosion for BWR stainless steel piping, piping components, and piping elements exposed to treated water. The staff also confirmed that there are no aluminum components exposed to treated water in the ESF systems. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3, Item 3, for further evaluation.

(4) In LRA Section 3.2.2.2.3, Item 4, the applicant addressed loss of material from pitting and crevice corrosion for stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that this aging effect is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.2.2.2.3, Item 4, states that loss of material from pitting and crevice corrosion could occur for stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil. The existing program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always have been adequate to preclude corrosion. Therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation 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 is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.2.14 and 3.0.3.1.6, respectively.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP. In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP.

In its letter dated February 1, 2007, the applicant amended the LRA Section 3.2.2.2.3, Item 4 to state "One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable.

The staff determined that the applicant's Oil Analysis Program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage loss of material from pitting and crevice corrosion for stainless steel and copper alloy piping, piping components, and piping elements exposed to lubricating oil.

On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3, Item 4, for further evaluation.

(5) In LRA Section 3.2.2.2.3, Item 5, the applicant addressed loss of material from pitting and crevice corrosion for partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. The applicant stated that at JAFNPP there are no outdoor stainless steel tanks in the ESF systems. This item is therefore not applicable.

The staff confirmed that there are no outdoor stainless steel tanks in the ESF systems at JAFNPP. On the basis that JAFNPP does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at

JAFNPP.

(6) In LRA Section 3.2.2.2.3, Item 6, the applicant addressed loss of material from pitting and crevice corrosion for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. The applicant stated that this aging effect is managed by the One-Time Inspection Program. This program uses visual and other NDE techniques to confirm that loss of material is not occurring or is so insignificant that an Aging Management Program for these components is not warranted.

SRP-LR Section 3.2.2.2.3, Item 6, states that loss of material from pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

Based on industry operating experience, the staff recognizes that stainless steel components exposed to condensation are not expected to experience significant degradation. As such, the staff considers a one-time inspection to confirm that significant degradation is not occurring adequate to manage this aging effect. The staff reviewed the applicant's One-Time Inspection Program and its evaluation is documented in SER Section 3.0.3.1.6. The staff determined that this program includes inspections and NDE techniques that are consistent with the recommendations in GALL Report, and are adequate to detect loss of material from pitting and crevice corrosion for stainless steel piping, piping components, piping elements, and tanks exposed to internal condensation. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3, Item 6, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.2.2.2.3. For those line items that apply to LRA Section 3.2.2.2.3, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.2.2.2.4 criteria.

(1) In LRA Section 3.2.2.2.4, Item 1, the applicant addressed reduction of heat transfer due to fouling for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The applicant stated that this aging effect is managed by the Oil Analysis Program for copper alloy heat exchanger tubes. There are no stainless steel or steel heat exchanger tubes exposed to lubricating oil in the ESF systems. The Oil Analysis Program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to fouling. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify

degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.2.2.2.4, Item 1, states that reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. The existing AMP relies on monitoring and control of lube oil chemistry to mitigate reduction of heat transfer due to fouling. However, control of lube oil chemistry may not always have been adequate to preclude fouling. Therefore, the effectiveness of lube oil chemistry control should be verified to ensure that fouling is not occurring. 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 not occurring or an aging effect is progressing very slowly such that the component’s intended function will be maintained during the period of extended operation.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP. In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP. In its response dated February 1, 2007, the applicant amended LRA Section 3.2.2.2.4, Item 1, to state “One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program.” The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable.

The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage reduction of heat transfer due to fouling for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.4, Item 1, for further evaluation.

(2) In LRA Section 3.2.2.2.4, Item 2, the applicant addressed reduction of heat transfer due to fouling for stainless steel heat exchanger tubes exposed to treated water. The applicant stated that this aging effect is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program, including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.2.2.2.4, Item 2, states that reduction of heat transfer due to fouling could occur for stainless steel heat exchanger tubes exposed to treated water. The existing program relies on control of water chemistry to manage reduction of heat

transfer due to fouling. However, control of water chemistry may have been inadequate. Therefore, the GALL Report recommends that the effectiveness of the chemistry control program should be verified to ensure that reduction of heat transfer due to fouling is not occurring. A one-time inspection is an acceptable method to ensure that reduction of heat transfer is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with the recommendations in GALL Report, and are adequate to manage reduction of heat transfer due to fouling of stainless steel heat exchanger tubes exposed to treated water. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.4, Item 2, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.2.2.2.4. For those line items that apply to LRA Section 3.2.2.2.4, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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

In LRA Section 3.2.2.2.5, the applicant stated that at JAFNPP there are no elastomeric components in the ESF systems; therefore, this item is not applicable to JAFNPP.

The staff reviewed the LRA and basis document and confirmed that there are no elastomeric components in the ESF systems at JAFNPP. On the basis that JAFNPP does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at JAFNPP.

3.2.2.2.6 Loss of Material Due to Erosion

This further evaluation addresses stainless steel high pressure safety injection (HPSI) pump miniflow recirculation orifice exposed to treated borated water. JAFNPP is a BWR and has no HPSI pump miniflow orifice; therefore, this item is not applicable.

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.

In LRA Section 3.2.2.2.7, the applicant addressed loss of material due to general corrosion and fouling for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled. The applicant stated that at JAFNPP the spray nozzles are copper alloy and are not subject to loss of material due to general corrosion in an indoor air environment. There are also no steel orifices in drywell and suppression chamber

spray systems exposed to an indoor air environment (internal).

SRP-LR Section 3.2.2.2.7 states that loss of material due to general corrosion and fouling can occur for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to air - indoor uncontrolled. This could result in plugging of the spray nozzles and flow orifices. This aging mechanism and effect will apply since the spray nozzles and flow orifices are occasionally wetted, even though the majority of the time this system is on standby. The wetting and drying of these components can accelerate corrosion and fouling. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that the aging effect is adequately managed.

The staff confirmed that the spray nozzles are copper alloy, and that there are no steel orifices in drywell and suppression chamber spray systems exposed to an indoor air environment (internal) in the ESF systems at JAFNPP. On the basis that JAFNPP does not have any components subject to this aging effect, the staff finds that this aging effect does not require management at JAFNPP.

The staff recognizes that, per industry operating experience, corrosion products in piping upstream of the spray system nozzles can dislodge and cause blockage of the nozzles.

During the audit and review, the staff asked the applicant if this has been experienced at JAFNPP and how it will be managed.

In its response, the applicant stated that surveillance testing is performed at JAFNPP to ensure that the drywell and suppression chamber spray nozzles are unobstructed by aligning service air to each of the spray headers and verifying air flow from each spray nozzle. This is performed every 10 years in accordance with the JAFNPP ISI Program. In past surveillance tests, some nozzle blockage was detected; however, it was below the acceptance criteria and was successfully removed. Continued surveillance testing during the period of extended operation will ensure that blockage does not impact nozzle flow capability. The staff considers the applicant's Inservice Inspection testing to be adequate to ensure that spray system nozzle flow capability is maintained during the period of extended operation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.2.2.2.7. For those line items that apply to LRA Section 3.2.2.2.7, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 SRP-LR Section 3.2.2.2.8 criteria.

(1) In LRA Section 3.2.2.2.8, Item 1, the applicant addressed loss of material due to general, pitting, and crevice corrosion for BWR steel piping, piping components, and piping elements exposed to treated water. The applicant stated that this aging effect is managed by the Water Chemistry Control – BWR Program. The effectiveness of the

Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this Program including susceptible locations such as areas of stagnant flow. The Periodic Surveillance and Preventive Maintenance Program supplements the Water Chemistry Control – BWR Program for components at the waterline in the suppression chamber and for components subject to erosion.

SRP-LR Section 3.2.2.2.8, Item 1, states that loss of material due to general, pitting, and crevice corrosion could occur for BWR steel piping, piping components, and piping elements exposed to treated water. The existing AMP relies on monitoring and control of water chemistry for BWRs to mitigate degradation. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the water chemistry control program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for BWR steel piping, piping components, and piping elements exposed to treated water. The staff finds that AMRs crediting these two programs are acceptable. With regard to the applicant's use of the Periodic Surveillance and Preventive Maintenance Program, the staff asked the applicant, during the audit and review, to clarify whether this program is in addition to the one-time inspection or whether it replaces the one-time inspection to verify the effectiveness of the Water Chemistry Control Program. In its response, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program replaces the one-time inspection for management of components at the waterline in the suppression chamber that are not continuously wetted. The Periodic Surveillance and Preventive Maintenance Program is credited for these components since a periodic inspection is needed to monitor aging of these components. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that it includes periodic inspections that are consistent with a one-time inspection and will be effective to verify the effectiveness of the water chemistry program for components at the waterline in the suppression chamber. The staff concluded that a periodic inspection is appropriate for these components since they are intermittently wetted, which could make them more susceptible to degradation. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.8, Item 1 for further evaluation.

(2) In LRA Section 3.2.2.2.8, Item 2, the applicant addressed loss of material due to general, pitting, and crevice corrosion for the internal surfaces of steel containment

isolation piping, piping components, and piping elements exposed to treated water. The applicant stated that this aging effect is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.2.2.2.8, Item 2, states that loss of material due to general, pitting, and crevice corrosion could occur for the internal surfaces of steel containment isolation piping, piping components, and piping elements exposed to treated water. The existing AMP relies on monitoring and control of 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 of stagnant flow conditions. Therefore, the effectiveness of the water chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the Chemistry Control Program. A one-time inspection of select components at susceptible locations is an acceptable method to determine whether an aging effect is not occurring or an aging effect is progressing very slowly such that the component’s intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for the internal surfaces of steel containment isolation piping, piping components, and piping elements exposed to treated water. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.8, Item 2, for further evaluation.

(3) In LRA Section 3.2.2.2.8, Item 3, the applicant addressed loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that this aging effect is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.2.2.2.8, Item 3, states that loss of material due to general, pitting, and crevice corrosion could occur for steel piping, piping components, and piping elements exposed to lubricating oil. The existing program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby

preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always have been adequate to preclude corrosion. Therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation 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 is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP. In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP. In its response dated February 1, 2007, the applicant amended the LRA Section 3.2.2.2.8, Item 3, to state "One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.8, Item 3, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.2.2.2.8. For those line items that apply to LRA Section 3.2.2.2.8, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.2.2.2.9, the applicant addressed loss of material due to general, pitting, crevice, and MIC for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. The applicant stated that this aging effect is managed by the Buried Piping and Tanks Inspection Program, which will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be

inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

SRP-LR Section 3.2.2.2.9 states that loss of material due to general, pitting, crevice, and MIC could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. 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, ensuring that loss of material is not occurring.

The staff reviewed the applicant's Buried Piping and Tanks Inspection Program and its evaluations are documented in SER Section 3.0.3.2.1. The staff determined that this program include opportunistic or focused inspections of buried components that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, crevice, and MIC for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in soil. The staff confirmed that inspections will be performed both during the 10-year period immediately prior to the period of extended operation, as well as during the 10-year period after entering the period of extended operation, which is consistent with the recommendations in GALL Report.

During the audit and review, the staff also asked the applicant for additional information on JAFNPP operating experience with buried components.

In its response, the applicant stated that a search of condition reports from the early 1990s to present identified only one incident in which a leak in a buried hydrogen supply line was evaluated. The root cause was determined to be poor application of the protective coating on the line, and was not aging related. Corrective actions were taken to replace the degraded section of buried piping. The staff reviewed the CR and determined that this incident was not age-related. In addition, the applicant stated that during the period from the mid 1990s to present, several fire protection system buried valves were excavated and none showed any evidence of corrosion. Based on a review of JAFNPP plant-specific operating experience, the staff confirmed that opportunistic inspections of buried components are performed at JAFNPP, and loss of material on buried components that would lead to a loss of intended function is not occurring. The staff finds that the JAFNPP operating experience supports the use of the Buried Piping and Tanks Inspection Program as an effective means of managing aging of buried components. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.9 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.2.2.2.9. For those line items that apply to LRA Section 3.2.2.2.9, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.2.10 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 provides the staff's evaluation of the applicant's QA program.

Conclusion. On the basis of its review, for component groups evaluated in the GALL Report, for
which the applicant has claimed consistency with the GALL Report and for which the GALL Report recommends further evaluation, the staff determined that the applicant has adequately addressed the issues recommended for further evaluated. 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 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.2.2-1 through 3.2.2-7, 3.3.2-14-1 through 3.3.2-14-14, 3.3.2-14-7, 3.3.2-14-8, 3.3.2-14-10, and 3.3.2-14-14 the staff reviewed additional details concerning the results of the AMRs for material, environment, AERM, and AMP combinations that are not consistent with the GALL Report, or that are not addressed in the GALL Report.

In LRA Tables 3.2.2-1 through 3.2.2-7, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information concerning how the aging effects will be managed. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is discussed in the following sections.

3.2.2.3.1 Residual Heat Removal System Summary of Aging Management Evaluation – LRA Table 3.2.2-1

The staff reviewed LRA Table 3.2.2-1, which summarizes the results of AMR evaluations for the residual heat removal system component groups.

The staff noted that LRA Table 3.2.2-1 includes an AMR line-item to address copper alloy nozzles in the Residual Heat Removal system exposed to air-indoor uncontrolled (external). The AMR line states that there are no aging mechanisms or effects for these

material/environment combinations. The AMR line cites Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The staff noted that the GALL Report does address other components constructed of copper alloy that are exposed to air, indoor-uncontrolled for which no aging effect is noted (e.g., Item EP-10 in Table V.F). In addition, based on industry operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the ESF systems containing this material/environment combination and confirmed that no aging effects have been experienced. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-1 includes an AMR line-item to address Heat Exchanger (tubes) in the Residual Heat Removal Systems constructed of stainless steel and exposed to treated water >140^{0}F. The Service Water Integrity Program is credited to manage loss of material-wear. The AMR line cites Generic Note H, which indicates that this aging effect is not in GALL Report for this component, material and environment combination.

During the audit and review, the staff asked the applicant to clarify why the Service Water Integrity Program, which addresses components exposed to service water, is credited for this AMR instead of a water chemistry AMP.

In its response, the applicant stated these heat exchangers are cooled by the service water system. Although the aging effect being managed is loss of material due to wear on the external tube surface, which is exposed to treated water, eddy current testing performed as part of the service water integrity program is more appropriate to detect loss of material for the tubes. The staff determined that eddy current testing is more appropriate for detecting and managing loss of material for the heat exchanger tubes since it can detect wall thinning. On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.2 Core Spray System Summary of Aging Management Evaluation – LRA Table 3.2.2-2

The staff reviewed LRA Table 3.2.2-2, which summarizes the results of AMR evaluations for the core spray system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.2.2.3.3 Automatic Depressurization System Summary of Aging Management Evaluation – LRA Table 3.2.2-3

The staff reviewed LRA Table 3.2.2-3, which summarizes the results of AMR evaluations for the automatic depressurization system component groups. The staff noted that LRA Table 3.2.2-3 includes an AMR line item for a “T-quencher” constructed of stainless steel and exposed to

steam (internal). The AMR line states that cracking-fatigue of this component is managed as a TLAA - metal fatigue. The AMR line cites Generic Note G, which indicates that this environment is not in GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

3.2.2.3.4 High Pressure Coolant Injection System Summary of Aging Management Evaluation – LRA Table 3.2.2-4

The staff reviewed LRA Table 3.2.2-4, which summarizes the results of AMR evaluations for the high pressure coolant injection system component groups.

The staff noted that LRA Table 3.2.2-4 includes AMR line items to address stainless steel orifice, rupture disk and valve body exposed to air-indoor uncontrolled (internal). The AMR results state that there are no aging mechanisms or effects for these material/ environment combinations. The AMR lines cite Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The staff noted that the GALL Report does address other components constructed of stainless steel that are exposed to air, indoor-uncontrolled for which no aging effect is noted (e.g., Item EP-18 in Table V.F). In addition, based on industry operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the ESF systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.2.2-4 includes AMR line items for stainless steel orifice, rupture disk and tubing exposed to steam (internal). The AMR results state that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line items cite Generic Note G, which indicates that this environment is not in GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

The staff noted that LRA Table 3.2.2-4 includes an AMR line item to address copper alloy heat exchanger tubes exposed to lubricating oil (external). The AMR line item credits the Heat Exchanger Monitoring Program to manage loss of material-wear for these components. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in GALL Report for this component, material, and environment combination. The staff reviewed the applicant’s Heat Exchanger Monitoring Program and determined that this program includes eddy current testing of a representative sample of heat exchanger tubes to detect aging degradation. If degradation is found, an evaluation is performed to determine if corrective actions are necessary. The staff finds that these activities are adequate to manage loss of material-wear for heat exchanger tubes exposed to lubricating oil in the ESF systems since eddy current testing is a proven technique to detect wall thinning in tubes. The staff’s review and evaluation of the applicant's Heat Exchanger Monitoring Program are documented in SER Section 3.0.3.3.1. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-4 includes an AMR line item to address copper alloy heat exchanger tubes exposed to treated water (external). The AMR line item credits the Heat Exchanger Monitoring Program to manage loss of material-wear for these components. The

AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Heat Exchanger Monitoring Program and determined that this program includes eddy current testing of a representative sample of heat exchanger tubes to detect aging degradation. If degradation is found, an evaluation is performed to determine if corrective actions are necessary. The staff finds that these activities are adequate to manage loss of material-wear for heat exchanger tubes exposed to treated water in the ESF systems since eddy current testing is a proven technique to detect wall thinning in tubes. The staff's review and evaluation of the applicant's Heat Exchanger monitoring Program are documented in SER Section 3.0.3.3.1. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-4 includes an AMR line item to address stainless steel valve bodies exposed to lubricating oil (internal). The AMR line item credits the Oil Analysis Program to manage cracking for these components. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Oil Analysis Program and its evaluations are documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic oil sampling and analysis to preserve an environment that is not conducive to cracking. In addition, the applicant will amend the LRA to include a one-time inspection to verify the effectiveness of the oil analysis program (See SER Section 3.2.2.2). The staff finds that these activities are adequate to manage cracking for valve bodies exposed to lubricating oil in the ESF systems since maintaining an acceptable level of lube oil purity provides an environment that is not conducive to cracking. This will be verified by a one-time inspection. On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.5 Reactor Core Isolation Cooling Summary of Aging Management Evaluation – LRA Table 3.2.2-5

The staff reviewed LRA Table 3.2.2-5, which summarizes the results of AMR evaluations for the reactor core isolation cooling component groups.

The staff noted that LRA Table 3.2.2-5 includes an AMR line item to address stainless steel piping exposed to air-outdoor (external). The AMR line item credits the External Surfaces Monitoring Program to manage loss of material for these components. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluations are documented in SER Section 3.0.3.2.9. The staff determined that this program includes periodic inspections of component external surfaces to detect aging degradation. The staff also determined that these activities are adequate to manage loss of material for stainless steel piping exposed to air-outdoor. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-5 includes AMR line items for stainless steel orifice, thermowell, tubing, and valve bodies exposed to steam (internal). The AMR line items state that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line items cite Generic Note G, which indicates that this environment is not in the GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.6 Standby Gas Treatment System Summary of Aging Management Evaluation – LRA Table 3.2.2-6

The staff reviewed LRA Table 3.2.2-6, which summarizes the results of AMR evaluations for the standby gas treatment system component groups. The staff noted that LRA Table 3.2.2-6 includes AMR line items to address copper alloy tubing, glass sight glasses, stainless steel flow elements, and stainless steel tubing exposed to air-indoor uncontrolled (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in GALL Report for these component and material combinations. The staff noted that the GALL Report does address other components constructed of copper alloy, glass, and stainless steel that are exposed to air, indoor-uncontrolled for which no aging effect is noted (e.g., Item EP-10, EP-15, and EP-18 in Table V.F, respectively). Based on industry operating experience, the staff recognizes that these material/environment combinations are not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the ESF systems containing these material/environment combinations and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.2.2-6 includes an AMR line item to address copper alloy piping exposed to soil (external). The AMR line item credits the Buried Piping and Tanks Inspection program to manage loss of material for these components. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The staff reviewed the applicant's Buried Piping and Tanks Inspection Program and determined that this program includes opportunistic or focused inspections of buried components to detect degradation. The staff finds that these activities are adequate to manage loss of material for copper alloy piping buried in soil. The staff confirmed that inspections will be performed both during the 10-year period immediately prior to the period of extended operation, as well as during the 10-year period after entering the period of extended operation. The staff also reviewed JAFNPP plant-specific operating experience and confirmed that loss of material on buried components that would lead to a loss of intended function during the period of extended operation is not occurring. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-6 includes an AMR line item for stainless steel tubing exposed to steam (internal). The AMR line item states that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line item cites Generic Note G, which indicates that this environment is not in the GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.7 Primary Containment Penetrations Summary of Aging Management Evaluation – LRA Table 3.2.2-7

The staff reviewed LRA Table 3.2.2-7, which summarizes the results of AMR evaluations for the primary containment penetrations component groups. The staff noted that LRA Table 3.2.2-7 includes AMR line items to address stainless steel piping, tubing, and valve bodies exposed to air-indoor uncontrolled (internal). The AMR line items state that there are no aging mechanisms or effects for these material/ environment combinations. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The staff noted that the GALL Report does address other components constructed of stainless steel that are exposed to air, indoor-uncontrolled for which no aging effect is noted (e.g., Item EP-18 in Table V.F). Based on industry operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the ESF systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.8 Gas Handling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-1

The staff reviewed LRA Table 3.3.2-14-1, which summarizes the results of AMR evaluations for the gas handling system component groups.

The staff noted that LRA Table 3.2.2-14-1 includes an AMR line item for stainless steel tubing exposed to steam (internal). The AMR line item states that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line item cites Generic Note G, which indicates that this environment is not in GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

3.2.2.3.9 Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-2

The staff reviewed LRA Table 3.3.2-14-2, which summarizes the results of AMR evaluations for the reactor coolant system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.2.2.3.10 Control Rod Drive System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-3

The staff reviewed LRA Table 3.3.2-14-3, which summarizes the results of AMR evaluations for the control rod drive system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.2.2.3.11 Residual Heat Removal System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-4

The staff reviewed LRA Table 3.3.2-14-4, which summarizes the results of AMR evaluations for the residual heat removal system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.2.2.3.12 Reactor Core Isolation Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-7

The staff reviewed LRA Table 3.3.2-14-7, which summarizes the results of AMR evaluations for the reactor core isolation cooling system component groups.

The staff noted that LRA Table 3.2.2-14-7 includes an AMR line item for stainless steel valve bodies exposed to steam (internal). The AMR line item states that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line item cites Generic Note G, which indicates that this environment is not in GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

3.2.2.3.13 Core Spray System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-8

The staff reviewed LRA Table 3.3.2-14-8, which summarizes the results of AMR evaluations for the core spray system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.2.2.3.14 Primary Containment System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-10

The staff reviewed LRA Table 3.3.2-14-10, which summarizes the results of AMR evaluations

for the primary containment system component groups.

The staff noted that LRA Table 3.2.2-14-10 includes an AMR line item to address copper alloy tubing exposed to air-indoor (internal). The AMR line item states that there are no aging mechanisms or effects for this material/environment combination. The AMR line item cites Generic Note H, which indicates that the aging effect is not addressed in GALL Report for this component, material, environment combination. Based on industry operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the ESF systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function during the period of extended operation have been experienced. On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.2.2.3.15 High Pressure Coolant Injection System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-14

The staff reviewed LRA Table 3.3.2-14-14, which summarizes the results of AMR evaluations for the high pressure coolant injection system component groups.

The staff noted that LRA Table 3.2.2-14-14 includes an AMR line item for stainless tubing exposed to steam (internal). The AMR line item states that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line item cites Generic Note G, which indicates that this environment is not in the GALL Report for this component and material combination. TLAAs are evaluated in SER Section 4.3.

Conclusion. On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations 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 systems components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 the following:

- standby liquid control
- service water
- emergency diesel generator
- fuel oil
- fire protection-water
- fire protection-CO_2
- heating, ventilation, and air conditioning
- containment purge, containment atmosphere dilution, and post-accident sampling
- fuel pool cooling and cleanup
- service, instrument, and breathing air
- reactor building closed loop cooling water
- radwaste and plant drains
- security generator
- miscellaneous systems in-scope for 10 CFR 54.4(a)(2)

3.3.1 Summary of Technical Information in the Application

In LRA Section 3.3, the applicant provided AMR results for the auxiliary systems components and component groups. In LRA Table 3.3.1, "Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the auxiliary systems components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.3.2 Staff Evaluation

The staff reviewed LRA Section 3.3 to determine whether the applicant provided sufficient information to demonstrate that the effects of aging for the auxiliary systems components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 AMRs. The staff's evaluations of the AMPs are documented in SER Section 3.0.3. Details of the staff's

audit evaluation are documented in SER Section 3.3.2.1.

In the onsite audit, the staff also selected AMRs that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.3.2.2. The staff's audit evaluations are documented in SER Section 3.3.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and whether the aging effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are documented in SER Section 3.3.2.3. The staff's evaluation of the technical review is also documented in SER Section 3.3.2.3.

The staff noted that the applicant has included all the 44 miscellaneous systems within the scope of 10 CFR 54.4(a)(2) in Section 3.3, "Auxiliary Systems," Tables 3.3.2-14-1 through 3.3.2-14-44. However, 8 of these systems are ESF systems and should have been included in Section 3.2, and 10 of these systems are in steam and power conversion (S&PC) systems and should have been included in Section 3.4. The Table 2s that apply to these 18 systems do reference Table 3.2.1 and Table 3.4.1 line items in the Table 1 line item reference column. This SER preparation is based on systems as defined in SRP-LR, Section 3.2, "ESF Systems," Section 3.3, "Auxiliary Systems," and Section 3.4, "S&PC Systems."

During the audit and review, the staff asked the applicant to justify why the nonsafety-related systems associated with ESF and S&PC systems were included in the auxiliary systems section.

In its response, the applicant stated that Section 14 (miscellaneous systems) includes all systems that have intended functions that meet 10 CFR 54.4(a)(2) for physical interaction. The aging management review of these systems was presented separately from the review of systems with intended functions that met 10 CFR 54.4(a)(1) or (a)(3) so that they could be reviewed separately on the basis of physical proximity rather than system function. This allows a reviewer to clearly distinguish which component types in a system were included for 10 CFR 54.4(a)(2) for physical interaction. Since most of these systems are auxiliary systems, they were added as part of the auxiliary systems section.

The staff reviewed the applicant's response and determined that this approach to presenting the AMRs for systems with intended functions meeting 10 CFR 54.4(a)(2) for physical interaction impedes the review process rather than facilitating it since the SER preparation is based on systems as defined in SRP-LR, which includes six specific sections. Each reviewer focuses on a specific section, and all of the systems included in that section. Therefore, the approach used in this LRA makes the review more cumbersome since the reviewers must also review Section 3 on auxiliary systems to ensure that all systems in their scope are addressed. However, the staff determined that this approach is administrative in nature, and does not impact the technical accuracy of these AMRs. Therefore, the staff finds this approach acceptable. The SER will split these tables and include them in their respective sections as follows:

- Section 3.2 – Tables 3.3.2-14-1, 2, 3, 4, 7, 8, 10, and 14
- Section 3.3 – Tables 3.3.2-14-5, 6, 9, 11, 12, 13, 15, 18, 23 to 41, and 43
- Section 3.4 – Tables 3.3.2-14-16, 17, 19, 20, 21, 22, 42, and 44

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the auxiliary systems components.

Table 3.3-1, provided below, includes a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.3, that are 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	AMP in LRA	Staff Evaluation
Steel cranes - structural girders exposed to air - indoor uncontrolled (external) (3.3.1-1)	Cumulative fatigue damage	TLAA to be evaluated for structural girders of cranes. See the Standard Review Plan, Section 4.7 for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1).	Not used	Consistent with GALL Report, which recommends further evaluation (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)	TLAA	Consistent with GALL Report, which recommends further evaluation (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	Not Applicable	Not applicable (See SER Section 3.3.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to sodium pentaborate solution > 60°C (> 140°F) (3.3.1-4)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Not Applicable	Not applicable (See SER Section 3.3.2.2.3, Item 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 stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.3, Item 2)
Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust (3.3.1-6)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated.	Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.3, Item 3)
Stainless steel non-regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-7)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Not Applicable	Not applicable to BWRs (See SER Section 3.3.2.2.4, Item 1)
Stainless steel regenerative heat exchanger components exposed to treated borated water > 60°C (> 140°F) (3.3.1-8)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated.	Not Applicable	Not applicable to BWRs (See SER Section 3.3.2.2.4, Item 2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel high-pressure pump casing in PWR chemical and volume control system (3.3.1-9)	Cracking due to stress corrosion cracking and cyclic loading	Water Chemistry and a plant-specific verification program. The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. A plant-specific aging management program is to be evaluated.	Not Applicable	Not applicable to BWRs (See SER Section 3.3.2.2.4, Item 3)
High-strength steel closure bolting exposed to air with steam or water leakage. (3.3.1-10)	Cracking due to stress corrosion cracking, cyclic loading	Bolting Integrity The AMP is to be augmented by appropriate inspection to detect cracking if the bolts are not otherwise replaced during maintenance.	Not Applicable	Not applicable (See SER Section 3.3.2.2.4, Item 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	Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.5, Item 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.	Not Applicable	Not applicable (See SER Section 3.3.2.2.5, Item 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	Water Chemistry Control-BWR (B.1.29.2)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.6)
Steel piping, piping component, and piping elements exposed to lubricating oil (3.3.1-14)	Loss of material due to general, pitting, and crevice corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.7, Item 1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
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	Not Applicable	Not applicable (See SER Section 3.3.2.2.7, Item 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	Not Applicable	Not applicable (See SER Section 3.3.2.2.7, Item 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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.7, Item 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	Periodic Surveillance and Preventive Maintenance (B.1.22) or Fire Protection (B.1.13.1)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.7, Item 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 microbiologically influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection (B.1.1)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.8)
Steel piping, piping components, piping elements, and tanks exposed to fuel oil (3.3.1-20)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fuel Oil Chemistry and One-Time Inspection	Diesel Fuel Monitoring (B.1.9)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.9, Item 1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel heat exchanger components exposed to lubricating oil (3.3.1-21)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.9, Item 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	Not Applicable	Not applicable (See SER Section 3.3.2.2.10, Item 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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 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.	External Surfaces Monitoring (B.1.11), Periodic Surveillance and Preventive Maintenance (B.1.22), or Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 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	Oil Analysis (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 4)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	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.	Bolting Integrity (B.1.30), External Surfaces Monitoring (B.1.11), Periodic Surveillance and Preventive Maintenance (B.1.22), or Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 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.	Periodic Surveillance and Preventive Maintenance (B.1.22), or One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 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.	Not Applicable	Not applicable (See SER Section 3.3.2.2.10, Item 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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.10, Item 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	Water Chemistry Control-BWR (B.1.29.2) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.11)
Stainless steel, aluminum and copper alloy piping, piping components, and piping elements exposed to fuel oil (3.3.1-32)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Fuel Oil Chemistry and One-Time Inspection	Diesel Fuel Monitoring (B.1.9)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.12, Item 1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, and piping elements exposed to lubricating oil (3.3.1-33)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil Analysis (B.1.20) and One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.3.2.2.12, Item 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.	Not Applicable	Not applicable (See SER Section 3.3.2.2.13)
Steel with stainless steel cladding pump casing exposed to treated borated water (3.3.1-35)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, "Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Not Applicable	Not applicable to BWRs (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	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-37)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	BWR Reactor Water Cleanup System	Water Chemistry Control-BWR (B.1.29.2) and One Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.1)
Stainless steel piping, piping components, and piping elements exposed to treated water > 60°C (> 140°F) (3.3.1-38)	Cracking due to stress corrosion cracking	BWR Stress Corrosion Cracking and Water Chemistry	Water Chemistry Control-BWR (B.1.29.2) and One Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel BWR spent fuel storage racks exposed to treated water > 60°C (> 140°F) (3.3.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
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	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
High-strength steel closure bolting exposed to air with steam or water leakage (3.3.1-41)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
Steel closure bolting exposed to air with steam or water leakage (3.3.1-42)	Loss of material due to general corrosion	Bolting Integrity	Not Used	Not used (See SER Section 3.3.2.1.21)
Steel bolting and closure bolting exposed to air - indoor uncontrolled (external) or air - outdoor (External) (3.3.1-43)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	Bolting Integrity (B.1.30)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Steel compressed air system closure bolting exposed to condensation (3.3.1-44)	Loss of material due to general, pitting, and crevice corrosion	Bolting Integrity	Bolting Integrity (B.1.30)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
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	Bolting Integrity (B.1.30)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.3)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water > 60°C (> 140°F) (3.3.1-46)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3) or Water Chemistry Control-Auxiliary Systems (B.1.29.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.4)
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-47)	Loss of material due to general, pitting, and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3), Water Chemistry Control-Auxiliary Systems (B.1.29.1), Fire Protection (B.1.13.1), or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.5)
Steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water (3.3.1-48)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3), Water Chemistry Control-Auxiliary Systems (B.1.29.1) or Fire Protection (B.1.13.1)	Consistent with GALL Report, which recommends no further (See SER Section 3.3.2.1.6)
Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water (3.3.1-49)	Loss of material due to microbiologically influenced corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3) or Water Chemistry Control-Auxiliary Systems (B.1.29.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.7)
Stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water (3.3.1-50)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3) or Water Chemistry Control-Auxiliary Systems (B.1.29.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.8)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.3.1-51)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3), Water Chemistry Control-Auxiliary Systems (B.1.29.1) or Fire Protection (B.1.13.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.9)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water (3.3.1-52)	Reduction of heat transfer due to fouling	Closed-Cycle Cooling Water System	Water Chemistry Control-Closed Cooling Water (B.1.29.3), Water Chemistry Control-Auxiliary Systems (B.1.29.1) or Fire Protection (B.1.13.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.10)
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	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
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	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
Steel ducting closure bolting exposed to air - indoor uncontrolled (external) (3.3.1-55)	Loss of material due to general corrosion	External Surfaces Monitoring	External Surfaces Monitoring (B.1.11)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
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	External Surfaces Monitoring (B.1.11)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel 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	External Surfaces Monitoring (B.1.11)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Steel external surfaces exposed to air - indoor uncontrolled (external), air - outdoor (external), and condensation (external) (3.3.1-58)	Loss of material due to general corrosion	External Surfaces Monitoring	External Surfaces Monitoring (B.1.11) or Fire Protection (B.1.13.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.11)
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	External Surfaces Monitoring (B.1.11)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Steel piping, piping components, and piping elements exposed to air - outdoor (external) (3.3.1-60)	Loss of material due to general, pitting, and crevice corrosion	External Surfaces Monitoring	External Surfaces Monitoring (B.1.11)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Elastomer fire barrier penetration seals exposed to air - outdoor or air - indoor uncontrolled (3.3.1-61)	Increased hardness, shrinkage and loss of strength due to weathering	Fire Protection	Not used	Not used (See SER Section 3.3.2.1.21)
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	One-Time Inspection (B.1.21)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.12)
Steel fire rated doors exposed to air - outdoor or air - indoor uncontrolled (3.3.1-63)	Loss of material due to Wear	Fire Protection	Not used	Not used (See SER Section 3.3.2.1.21)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to fuel oil (3.3.1-64)	Loss of material due to general, pitting, and crevice corrosion	Fire Protection and Fuel Oil Chemistry	Fire Protection (B.1.13.1) and Diesel Fuel Monitoring (B.1.9)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
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	Not used	Not used (See SER Section 3.3.2.1.21)
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	Not used	Not used (See SER Section 3.3.2.1.21)
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	Not used	Not used (See SER Section 3.3.2.1.21)
Steel piping, piping components, and piping elements exposed to raw water (3.3.1-68)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	Fire Water System (B.1.13.1) or Fire Protection (B.1.13.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.13)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-69)	Loss of material due to pitting and crevice corrosion, and fouling	Fire Water System	Fire Water System (B.1.13.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-70)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Fire Water System	Fire Water System (B.1.13.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to moist air or condensation (Internal) (3.3.1-71)	Loss of material due to general, pitting, and crevice corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.14)
Steel HVAC ducting and components internal surfaces exposed to condensation (Internal) (3.3.1-72)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Not applicable	Not applicable See SER Section 3.3.2.1.20)
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	Not Used	Not used (See SER Section 3.3.2.1.21)
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	Not Used	Not used (See SER Section 3.3.2.1.21)
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	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
Steel piping, piping components, and piping elements (without lining/ coating or with degraded lining/coating) exposed to raw water (3.3.1-76)	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26) or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.15)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel heat exchanger components exposed to raw water (3.3.1-77)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26) or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.16)
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	Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Stainless steel piping, piping components, and piping elements exposed to raw water (3.3.1-79)	Loss of material due to pitting and crevice corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26), One-Time Inspection (B.1.21), or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.17)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.3.1-80)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Open-Cycle Cooling Water System	Not Used	Not used (See SER Section 3.3.2.1.21)
Copper alloy piping, piping components, and piping elements, exposed to raw water (3.3.1-81)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26), One-Time Inspection (B.1.21), or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.18)
Copper alloy heat exchanger components exposed to raw water (3.3.1-82)	Loss of material due to pitting, crevice, galvanic, and microbiologically influenced corrosion, and fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel and copper alloy heat exchanger tubes exposed to raw water (3.3.1-83)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	Service Water Integrity (B.1.26), Fire Protection (B.1.13.1), or Periodic Surveillance and Preventive Maintenance (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1.19)
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	Selective Leaching (B.1.25)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Gray cast iron piping, piping components, and piping elements exposed to soil, raw water, treated water, or closed-cycle cooling water (3.3.1-85)	Loss of material due to selective leaching	Selective Leaching of Materials	Selective Leaching (B.1.25)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.3.2.1)
Structural steel (new fuel storage rack assembly) exposed to air - indoor uncontrolled (external) (3.3.1-86)	Loss of material due to general, pitting, and crevice corrosion	Structures Monitoring Program	Not Used	Not used (See SER Section 3.3.2.1.21)
Boraflex spent fuel storage racks neutron-absorbing sheets exposed to treated borated water (3.3.1-87)	Reduction of neutron-absorbing capacity due to boraflex degradation	Boraflex Monitoring	Not Applicable	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Aluminum and copper alloy > 15% 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	Not Applicable	Not applicable to BWRs
Steel bolting and external surfaces exposed to air with borated water leakage (3.3.1-89)	Loss of material due to Boric acid corrosion	Boric Acid Corrosion	Not Applicable	Not applicable to BWRs
Stainless steel and steel with stainless steel cladding piping, piping components, piping elements, tanks, and fuel storage racks exposed to treated borated water > 60°C (> 140°F) (3.3.1-90)	Cracking due to stress corrosion cracking	Water Chemistry	Not Applicable	Not applicable to BWRs
Stainless steel and steel with stainless steel cladding piping, piping components, and piping elements exposed to treated borated water (3.3.1-91)	Loss of material due to pitting and crevice corrosion	Water Chemistry	Not Applicable	Not applicable to BWRs
Galvanized steel piping, piping components, and piping elements exposed to air - indoor uncontrolled (3.3.1-92)	None	None	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Glass piping elements exposed to air, air - indoor uncontrolled (external), fuel oil, lubricating oil, raw water, treated water, and treated borated water (3.3.1-93)	None	None	None	Consistent with 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	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	Not Applicable	Not applicable (See SER Section 3.3.2.1.20)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.3.1-96)	None	None	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	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	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	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	Not Applicable	Not applicable to BWRs

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, discusses the staff's review of the AMR results for components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in SER Section 3.3.2.2, discusses the staff's review of the 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, discusses the staff's review of the 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 that are 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 That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.3.2.1, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the effects of aging related to the auxiliary systems components:

- Buried Piping and Tanks Inspection Program
- Diesel Fuel Monitoring Program
- External Surfaces Monitoring Program
- Fire Protection Program
- Fire Water System Program
- Flow-Accelerated Corrosion Program
- Heat Exchanger Monitoring Program
- Oil Analysis Program
- One-Time Inspection Program
- Periodic Surveillance and Preventive Maintenance Program
- Selective Leaching Program
- Service Water Integrity Program
- Water Chemistry Control - Auxiliary Systems Program
- Water Chemistry Control - BWR Program
- Water Chemistry Control - Closed Cooling Water Program
- Bolting Integrity Program

In LRA Tables 3.3.2-1 through 3.3.2-13, 3.3.2-14-5, 3.3.2-14-6, 3.3.2-14-9, 3.3.2-14-11, 3.3.2-14-12, 3.3.2-14-13, 3.3.2-14-15, 3.3.2-14-18, 3.3.2-14-23 through 3.3.2-14-41, 3.3.2-14-43, and 3.3.2-14-44, the applicant provided a summary of AMRs for the auxiliary systems components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes describe how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E, which indicate that 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report and the 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant is consistent with the AMP identified in the GALL Report 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 AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report that has the same material, environment, aging effect, and AMP as the component that was 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 AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report 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 a different AMP is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

3.3.2.1.1 Cracking due to Stress Corrosion Cracking and Intergranular Stress Corrosion Cracking

LRA Table 3.3.1, Item 3.3.1-37, addresses cracking due to stress corrosion cracking (SCC) and intergranular stress corrosion cracking (IGSCC) for stainless steel piping, piping components, and piping elements exposed to treated water >60ºC (>140ºF) in the auxiliary systems. The LRA credits the Water Chemistry Control-BWR Program together with the One-Time Inspection Program. The GALL Report recommends AMP XI.M25, "BWR Reactor Water Cleanup System," to manage this aging effect. The LRA states that the only components to which this GALL Report line item applies are included in license renewal scope only under criterion 10 CFR 54.4(a)(2) and listed in table 3.3.2-14-6 for nonsafety-related reactor water cleanup system components affecting safety-related systems. The Table 2 AMR line items in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

In LRA Table 3.3.1, Item 3.3.1-37, the applicant stated that the BWR Reactor Water Cleanup System Program is not credited for license renewal. The GALL Report states that no IGSCC inspection is recommended for plants that have piping made of material that is resistant to IGSCC and have satisfactorily completed all actions requested in NRC GL 89-10. The applicant states that since JAFNPP satisfies these criteria, the Water Chemistry Control-BWR Program is used in lieu of the reactor water cleanup system program to manage cracking. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program.

The staff reviewed GALL AMP XI.M25 and determined that it includes water chemistry control activities and in-service inspections. Also, the staff reviewed GL 89-10 and the applicant's response and confirmed that no IGSCC inspection is recommended for plants that have piping made of material that is resistant to IGSCC and have satisfactorily completed all actions requested. The staff also reviewed the applicant’s Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that it includes activities that will maintain high water purity and the applicant's Water Chemistry Control-BWR Program is consistent with GALL AMP XI.M25, which is effective for managing cracking due to SCC and IGSCC for stainless steel components exposed to treated water. The staff determined that a One-Time Inspection will be effective in detecting any cracking in these Reactor Water Cleanup nonsafety components. Since the applicant is crediting the Water Chemistry Control-BWR Program and the One-Time Inspection Program, the staff finds that the activities being credited are adequate to manage these aging effects and are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the aging effect/mechanism (AEM) appropriately as recommended by the GALL Report.

3.3.2.1.2 Cracking due to Stress Corrosion Cracking [1]

LRA Table 3.3.1, Item 3.3.1-38, addresses cracking due to stress corrosion cracking (SCC) for stainless steel piping, piping components, and piping elements exposed to treated water >60 °C (>140 °F) in the auxiliary systems. The LRA credits the Water Chemistry Control-BWR Program together with the One-Time Inspection Program. The GALL Report recommends AMPs XI.M7, "BWR Stress Corrosion Cracking," and XI.M2, "Water Chemistry," to manage this aging effect. The LRA states that the only components to which this GALL Report line item applies are included within the scope of license renewal only under criterion 10 CFR 54.4(a)(2), and are listed in table 3.3.2-14-15 (containment purge, containment atmospheric dilution, and post-accident sampling), 3.3.2-14-18 (decay heat removal), 3.3.2-14-24 (Vacuum Priming and Air Removal), 3.3.2-14-27 (Secondary Plant Drains), and 3.3.2-14-43 (Sample system) for nonsafety-related components affecting safety-related systems. The Table 2 AMR line items in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

In Table 3.3.1, Item 3.3.1-38, the applicant stated that none of the auxiliary system components addressed by this AMR line item are within the scope of the BWR Stress Corrosion Cracking Program (all relevant components are included in the reactor vessel, internals and reactor coolant systems). Therefore, the Water Chemistry Control-BWR Program is used to manage cracking of stainless steel components. The One-Time Inspection Program will be used to verify the effectiveness of the water chemistry program.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff confirmed that they are nonsafety-related components, and are not within the scope of the applicant's BWR Stress Corrosion Cracking Program. The staff determined that the Water Chemistry Control-BWR Program includes activities that are consistent with the recommendations in GALL AMP XI.M7 to maintain high water purity, which is effective for managing cracking due to SCC for stainless steel components exposed to treated water. The staff noted that these are nonsafety-related components in auxiliary systems and a one-time inspection will be effective in detecting any cracking. Since the applicant is crediting the Water Chemistry Control-BWR Program and the One-Time Inspection Program, the staff determined that the activities being credited are adequate to manage these aging effects.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.3 Loss of Preload due to Thermal Effects, Gasket Creep, and Self Loosening

LRA Table 3.3.1, Item 3.3.1-45, addresses loss of preload due to thermal effects, gasket creep, and self loosening for steel closure bolting exposed to uncontrolled, external, indoor air in the auxiliary systems. The LRA states that this aging effect is not applicable for auxiliary systems and no aging management program is credited. The GALL Report recommends GALL AMP XI.M18, "Bolting Integrity," to manage this aging effect.

During the audit and review, the staff asked the applicant to clarify why this aging effect is not applicable at JAFNPP. In its response, the applicant stated that this position is consistent with the EPRI Mechanical Tools report (EPRI 1010639); however, the bolting integrity program is currently used at JAFNPP to monitor these components. The applicant committed to amend the LRA to delete “Not Applicable” from this AMR line item. In its letter dated February 1, 2007, the applicant amended the LRA to delete “Not Applicable” from the discussion column of AMR line Item 3.3.1-45. The staff reviewed the applicant’s bolting integrity program and its evaluations are documented in SER Section 3.0.3.2.20. The staff determined that it is consistent with the recommendations in GALL AMP XI.M18 and includes activities that will manage loss of preload for these components. On this basis, the staff finds the AMR results for this line item acceptable.

3.3.2.1.4 Cracking due to Stress Corrosion Cracking [2]

LRA Table 3.3.1, Item 3.3.1-46, addresses cracking due to stress corrosion cracking (SCC) for stainless steel and stainless clad steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water >60ºC (>140ºF) in the auxiliary systems. The LRA credits the Water Chemistry Control-Closed Cooling Water Program or the Water Chemistry Control-Auxiliary Systems Program. The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water," to manage this aging effect. The LRA states that the only components to which this GALL Report line item applies are included in-scope only under criterion 10 CFR 54.4(a)(2) and are listed in table 3.3.2-14-6 (RWCU system heat exchanger shell) and 3.3.2-14-40 (tubing for the auxiliary boiler and accessories) for nonsafety-related components affecting safety-related systems. The Table 2 AMR line items in the LRA that reference this Table 1 line item and credit the Water Chemistry Control-Auxiliary Systems Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different AMP is credited. These AMR line items include a plant-specific note stating that the treated water environment is auxiliary boiler water which does not directly compare with any GALL Report environment, but closely approximates the GALL Report-defined treated water environment.

The staff reviewed the applicant’s Water Chemistry Control-Closed Cooling Water Program and its evaluations are documented in SER Section 3.0.3.2.19. The staff verified that this aging management program is consistent with the recommendations in the GALL AMP XI.M21 to maintain high water purity, which is effective for managing cracking due to SCC for stainless steel and stainless clad steel components exposed to closed cycle cooling water. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of this program to manage cracking. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Closed Cooling Water Program are consistent with the GALL Report, and are acceptable.

The staff also reviewed the Water Chemistry Control-Auxiliary Systems Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.3.5 and 3.0.3.1.6, respectively. The staff determined that the Water Chemistry Control-Auxiliary Systems Program includes activities that are consistent with the recommendations in GALL AMP XI.M21 to maintain high water purity, which is effective for managing cracking due to SCC for stainless steel and stainless clad steel components exposed to closed cycle cooling water. The staff noted that the components for which this AMP is credited are nonsafety components in auxiliary systems, and that a one-time inspection will be effective in detecting any cracking. Since the applicant is crediting the Water Chemistry Control-Auxiliary Systems Program with the One-Time Inspection Program for verification of effectiveness, the activities being credited are consistent with GALL AMP XI.M21 recommendations to manage these aging effects. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Auxiliary Systems Program are acceptable.

3.3.2.1.5 Loss of Material due to General, Pitting, and Crevice Corrosion

LRA Table 3.3.1, Item 3.3.1-47, addresses loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, piping elements, tanks, and heat exchangers exposed to closed cycle cooling water. The LRA credits the Water Chemistry Control-Closed Cooling Water Program, Water Chemistry Control-Auxiliary Systems Program, Fire Protection Program, or the Periodic Surveillance and Preventive Maintenance Program. The GALL Report recommends GALL AMP XI.M21, "Closed-Cycle Cooling Water System," to manage this aging effect. Table 2 AMR line items in the LRA that reference this Table 1 line item and credit the Water Chemistry Control-Auxiliary Systems Program, Fire Protection Program, or the Periodic Surveillance and Preventive Maintenance Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The AMR line items that credit the Water Chemistry Control-Auxiliary Systems Program are for components in Tables 3.3.2-7 (HVAC system), 3.3.2-14-32 (Reactor Building Ventilation), 3.3.2-14-33 (Turbine Building Ventilation), 3.3.2-14-34 (Drywell Ventilation and Cooling), 3.3.2-14-14-35 (Administration Building Ventilation and Cooling), 3.3.2-14-40 (Auxiliary Boiler and Accessories), and 3.3.2-14-42 (Main Generator Stator Cooling). Plant-specific notes are also cited: for HVAC, indicating that this component is part of the chilled water subsystem for the control room HVAC system and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment; for the reactor building, turbine building, drywell, and administration building ventilation and cooling systems, indicating that this treated water system environment is plant heating system water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment; for the auxiliary boiler, indicating that this treated water system environment is auxiliary boiler system water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment; and for the main generator stator cooling, indicating that this treated water system environment is main generator stator cooling water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment.

In addition to the water chemistry control programs, the LRA credits the Fire Protection Program for managing loss of material due to general, pitting, and crevice corrosion for AMR line items in Table 3.3.2-5 for steel piping and steel valve body components in the Fire Protection-Water system, and the Periodic Surveillance and Preventive Maintenance Program for managing loss of material due to general, pitting, and crevice corrosion for AMR line items in Table 3.3.2-14-23 for steel piping in the TBCLC system. Plant-specific Notes for the Fire Protection Program indicate that the treated water environment is engine jacket cooling water, and for the Periodic Surveillance and Preventive Maintenance Program indicate that the portions of the TBCLC system piping that are subject to erosion are included in augmented inspections for flow accelerated corrosion as part of the Periodic Surveillance and Preventive Maintenance Program.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and its evaluation is documented in SER Section 3.0.3.2.19. The staff verified that this aging management program includes activities that are consistent with the recommendations in the GALL AMP XI.M21 to maintain high water purity, which is effective for managing loss of material due to general, pitting, and crevice corrosion for steel components exposed to closed cycle cooling water. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Closed Cooling Water Program to manage loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Closed Cooling Water Program are consistent with the GALL Report and are acceptable.

The staff also reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program and its evaluation is documented in SER Section 3.0.3.3.5. The staff determined that this aging management program includes activities that are consistent with the recommendations in the GALL AMP XI.M21 to maintain high water purity, which is effective for managing loss of material due to general, pitting, and crevice corrosion for steel components exposed to closed cycle cooling water. The staff confirmed that the one-time inspection program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Auxiliary Systems Program to manage loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Auxiliary Systems Program are acceptable.

The staff reviewed the applicant's Fire Protection Program and determined that this program includes periodic testing and inspection of the fire pump and engine to ensure that the engine subsystems can perform their intended function. The staff finds that these inspections will be effective to detect loss of material. On this basis, the staff finds that AMRs addressed by this line item that credit the Fire Protection Program are acceptable.

Finally, the staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and verified that this aging management program includes augmented inspections using NDE techniques that will be effective to detect loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Periodic Surveillance and Preventive Maintenance Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.6 Loss of Material due to General, Pitting, Crevice, and Galvanic Corrosion

LRA Table 3.3.1, Item 3.3.1-48, addresses loss of material due to general, pitting, crevice, and galvanic corrosion for steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to closed cycle cooling water in the auxiliary systems. The LRA credits the Water Chemistry Control-Closed Cooling Water Program, Water Chemistry Control-Auxiliary Systems Program, or the Fire Protection Program. The GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items in the LRA that reference this Table 1 line item and credit the Water Chemistry Control-Auxiliary Systems Program or the Fire Protection Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The LRA states that the AMR that credits the Water Chemistry Control-Auxiliary Systems Program, listed in Table 3.3.2-7 (HVAC system), is consistent with the GALL AMP XI.M21 which recommends no further evaluation. It also cites a plant-specific note indicating that this component is part of the chilled water subsystem of the control room HVAC system and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cycle cooling water environment.

The LRA credits the Fire Protection Program for managing loss of material due to general, pitting, crevice, and galvanic corrosion for the AMR line items in Table 3.3.2-5 for a gray cast iron heat exchanger shell in the Fire Protection-Water system. A plant-specific note indicates that the treated water environment is engine jacket cooling water.

The staff reviewed the applicant's Water Chemistry Control-Closed Cooling Water Program and its evaluation is documented in SER Section 3.0.3.2.19. The staff verified that this aging management program includes activities that are consistent with the recommendations in the GALL AMP XI.M21 to maintain high water purity, which is effective for managing loss of material due to general, pitting, crevice, and galvanic corrosion for steel components exposed to closed cycle cooling water. The staff confirmed that the one-time inspection program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Closed Cooling Water Program to manage loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Closed Cooling Water Program are consistent with GALL AMP XI.M21 and are acceptable.

The staff also reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program and its evaluation is documented in SER Section 3.0.3.3.5. The staff determined that this aging management program includes activities that are consistent with the recommendations in GALL AMP XI.M21 to maintain high water purity, which is effective for managing loss of material due to general, pitting, crevice, and galvanic corrosion for steel components exposed to closed cycle cooling water. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Auxiliary Systems Program

to manage loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Auxiliary Systems Program are acceptable.

The staff also reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that this program includes periodic testing and inspection of the fire pump and engine to ensure that the engine subsystems can perform their intended function. The staff finds that these inspections will be effective to detect loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Fire Protection Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.7 Loss of Material due to Microbiologically-Influenced Corrosion

LRA Table 3.3.1, Item 3.3.1-49, addresses loss of material due to MIC for stainless steel and steel with stainless steel cladding heat exchanger components exposed to closed cycle cooling water in the auxiliary systems. The LRA credits the Water Chemistry Control-Closed Cooling Water Program or the Water Chemistry Control-Auxiliary Systems Program. The GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items crediting the Water Chemistry Control-Auxiliary Systems Program in the LRA that references this Table 1 line item cites Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The LRA states that the AMR that credits the Water Chemistry Control-Auxiliary Systems, listed in Table 3.3.2-14-18 (Decay Heat Removal system), is consistent with the GALL Report which recommends no further evaluation. It also cites a Plant Specific note that indicates that the treated water environment is decay heat removal system secondary cooling loop water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cycle cooling water environment.

The staff reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program and its evaluations are documented in SER Sections 3.0.3.2.19, and 3.0.3.3.5, respectively. The staff verified that these aging management programs include activities that are consistent with the recommendations in the GALL AMP XI.M21 to maintain high water purity, which is effective for managing loss of material due to MIC for stainless steel and steel with stainless steel cladding components exposed to closed cycle cooling water. The staff reviewed the applicant's One-Time Inspection Program and its evaluation is documented in SER Section 3.0.3.1.6. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program to manage loss of material.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report,

the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.8 Loss of Material due to Pitting and Crevice Corrosion

LRA Table 3.3.1, Item 3.3.1-50, addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water in the auxiliary systems. The LRA credits the Water Chemistry Control-Closed Cooling Water Program or the Water Chemistry Control-Auxiliary Systems Program. The GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items crediting the Water Chemistry Control-Auxiliary Systems Program in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The LRA states that the AMR line items that credit the Water Chemistry Control-Auxiliary Systems, listed in Tables 3.3.2-7 (HVAC systems), 3.3.2-14-18 (Decay Heat Removal system), and 3.3.2-14-40 (Auxiliary Boiler and Accessories) are consistent with the GALL Report which recommends no further evaluation. Plant Specific notes are cited: for HVAC, indicating that this component is part of the chilled water subsystem for the control room HVAC system and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment; for the decay heat removal system, indicating that the treated water environment is decay heat removal system secondary cooling loop water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cycle cooling water environment; and for the auxiliary boiler, indicating that this treated water system environment is auxiliary boiler system water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment.

The staff reviewed the applicant’s Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program and its evaluations are documented in SER Sections 3.0.3.2.19, and 3.0.3.3.5, respectively. The staff verified that these aging management programs include activities that are consistent with the recommendations in the GALL Report Closed-Cycle Cooling Water Chemistry Program to maintain high water purity, which is effective for managing loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to closed cycle cooling water. The staff reviewed the applicant’s One-Time Inspection Program and its evaluation is documented in SER Section 3.0.3.1.6. The staff confirmed that the One-time inspection program will be used to verify the effectiveness of the applicant’s Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program to manage loss of material.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.9 Loss of Material due to Pitting, Crevice, and Galvanic Corrosion

LRA Table 3.3.1, Item 3.3.1-51, addresses loss of material due to pitting, crevice, and galvanic corrosion for copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in the auxiliary systems. The LRA credits the Water Chemistry Control-Closed Cooling Water Program, Water Chemistry Control-Auxiliary Systems Program, or the Fire Protection Program. The GALL Report recommends AMP XI.M21, " Closed-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items crediting the Water Chemistry Control-Auxiliary Systems Program or the Fire Protection Program in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR is consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The LRA states that the AMRs that credit the Water Chemistry Control-Auxiliary Systems Program are consistent with the GALL Report which recommends no further evaluation. These are listed in Table 3.3.2-7 (HVAC system), Table 3.3.2-13 (Security Generator), Table 3.3.2-14-32 (Reactor Building Ventilation system), Table 3.3.2-14-33 (Turbine Building Ventilation system), Table 3.3.2-14-34 (Drywell Ventilation and Cooling system), Table 3.3.2-14-35 (Administration Building Ventilation and Cooling system), and Table 3.3.2-14-36 (Screenwell/Water Treatment Ventilation and Cooling system). Plant Specific notes are cited: for HVAC, indicating that this component is part of the chilled water subsystem for the control room HVAC system and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment; for the Security Generator, indicating that the treated water environment is engine jacket cooling water; and for the ventilation and cooling systems, indicating that this treated water system environment is plant heating system water and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment.

The LRA credits the Fire Protection Program for managing loss of material due to pitting, crevice, and galvanic corrosion for AMR line items in Table 3.3.2-5 in the Fire Protection-Water system. A Plant Specific Note indicates that the treated water environment is engine jacket cooling water.

The staff reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program and its evaluations are documented in SER Sections 3.0.3.2.19, and 3.0.3.3.5, respectively. The staff verified that these aging management programs include activities that are consistent with the recommendations in the GALL AMP XI.M21 to maintain high water purity, which is effective for managing loss of material due to pitting, crevice, and galvanic corrosion for copper alloy piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water in the auxiliary systems. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program to manage loss of material. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Auxiliary Systems Program or the Water Chemistry Control-Closed Cooling Water Program are acceptable.

The staff also reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that this aging management program includes visual inspections of diesel exhaust piping and components; and copper alloy piping, piping components, piping elements, and heat exchanger components exposed to engine jacket cooling water to manage loss of material. These inspections will manage loss of material such that the intended function of the components will not be affected. The Fire Protection Program states that the diesel-driven fire pump inspection requires that the pump and its driver be periodically tested and inspected to ensure that diesel engine subsystems, including the fuel supply line, can perform their intended functions. The staff finds that this program will be effective for managing loss of material due to pitting, and crevice corrosion for copper alloy piping, piping components, piping elements, and heat exchanger components exposed to engine jacket cooling water. On this basis, the staff finds that AMR results addressed by this line item that credit the Fire Protection Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.10 Reduction of Heat Transfer due to Fouling [1]

LRA Table 3.3.1, Item 3.3.1-52, addresses reduction of heat transfer due to fouling for steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water in the auxiliary systems. The LRA credits the Water Chemistry Control-Closed Cooling Water Program, Water Chemistry Control-Auxiliary Systems Program, or the Fire Protection Program. The GALL Report recommends AMP XI.M21, "Closed-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items crediting the Water Chemistry Control-Auxiliary Systems Program or the Fire Protection Program in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The LRA states that the AMR line items that credit the Water Chemistry Control-Auxiliary Systems Program are consistent with the GALL Report which recommends no further evaluation. These are listed in Table 3.3.2-7 (HVAC system) and Table 3.3.2-13 (Security Generator). Plant Specific notes are cited: for HVAC, indicating that this component is part of the chilled water subsystem for the control room HVAC system and that although this environment does not directly compare with any GALL Report defined environment, it approximates the GALL Report defined closed cooling water environment; and for the Security Generator, indicating that the treated water environment is engine jacket cooling water.

The LRA credits the Fire Protection Program for reduction of heat transfer due to fouling for AMR items in Table 3.3.2-5 in the Fire Protection-Water system. A Plant Specific Note indicates that the treated water environment is engine jacket cooling water.

The staff reviewed the applicant's Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program and its evaluations are documented in SER Sections 3.0.3.2.19, and 3.0.3.3.5, respectively. The staff verified that these aging

management programs include activities that are consistent with the recommendations in the GALL Report Closed-Cycle Cooling Water Chemistry Program to maintain high water purity, which is effective for managing reduction of heat transfer due to fouling for steel, stainless steel, and copper alloy heat exchanger tubes exposed to closed cycle cooling water in the auxiliary systems. The staff confirmed that the One-Time Inspection Program will be used to verify the effectiveness of the applicant's Water Chemistry Control-Auxiliary Systems Program and the Water Chemistry Control – Closed Cooling Water Program to manage reduction of heat transfer due to fouling. On this basis, the staff finds that AMR results addressed by this line item that credit the Water Chemistry Control-Auxiliary Systems Program or the Water Chemistry Control-Closed Cooling Water Program are acceptable.

The staff also reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The Fire Protection Program states that the diesel-driven fire pump inspection requires that the pump and its driver be periodically tested and inspected to ensure that diesel engine subsystems, including the fuel supply line, can perform their intended functions. The staff determined that these inspections will manage reduction of heat transfer due to fouling for steel, stainless steel, and copper alloy heat exchanger tubes exposed to engine jacket cooling water such that the intended function of the components will not be affected. On this basis, the staff finds that AMR results addressed by this line item that credit the Fire Protection Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.11 Loss of Material due to General Corrosion

LRA Table 3.3.1, Item 3.3.1-58, addresses loss of material due to general corrosion for steel external surfaces exposed to uncontrolled indoor air (external), outdoor air (external), and condensation (external) in the auxiliary systems. The LRA credits the External Surfaces Monitoring Program or the Fire Protection Program. The GALL Report recommends AMP XI.M36, "External Surfaces Monitoring," to manage this aging effect. The Table 2 AMR line items crediting the Fire Protection Program in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited. The Fire Protection Program is credited to manage loss of material on the external surfaces of carbon steel components in the Fire Protection-CO_2 system exposed to indoor air.

The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.9. The staff confirmed that it includes inspections of external surfaces that are consistent with the recommendations in the GALL Report External Surfaces Monitoring Program and are appropriate for managing loss of material due to general corrosion in the auxiliary systems. On this basis, the staff finds that AMR results addressed by this line item that credit the External Surfaces Monitoring Program are acceptable.

The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that this aging management program includes

periodic inspections and functional tests of the CO_2 fire suppression system, which are performed at least once every six months to check for signs of degradation. These inspections include visual inspections of external surfaces of the system components. Since the External Surfaces Monitoring Program also recommends visual inspections of external surfaces at least once per refueling cycle, the staff finds the applicant's Fire Protection Program adequate to manage loss of material for components in the Fire Protection-CO_2 system. The staff finds that these inspections will manage loss of material due to general corrosion such that the intended function of the components will not be affected.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report

3.3.2.1.12 Loss of Material due to Pitting and Crevice Corrosion

LRA Table 3.3.1, Item 3.3.1-62, addresses loss of material due to pitting and crevice corrosion for aluminum piping, piping components, and piping elements exposed to raw water in the auxiliary systems. The LRA credits the One-Time Inspection Program. The GALL Report recommends AMP XI. M26, "Fire Protection," to manage this aging effect. The Table 2 AMR line item in the LRA that references this Table 1 line item cites Generic Note E, indicating that the AMR line item is consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

In its response to the staff's request to justify the use of the One-Time Inspection Program instead of the Fire Protection Program recommended by the GALL Report to manage this aging effect, the applicant stated that, as identified in LRA Table 3.3.1, line Item 62, the only components to which this GALL Report line item applies are included in-scope under criterion 10 CFR 54.4(a)(2) and are listed in LRA Table 3.3.2-14-13 (Radwaste system). As indicated in this table, the aluminum component addressed by Table 3.3.1, line Item 62 is a tank in the radwaste system. The applicant further stated that aluminum is a corrosion resistant material that is not expected to experience significant loss of material in this environment. As described in LRA Appendix B, the One-Time Inspection Program will confirm that the loss of material is not occurring or insignificant such that an aging management program is not warranted for this component.

The staff reviewed the applicant's One-Time Inspection Program and its evaluation is documented in SER Section 3.0.3.1.6. The staff determined that it includes inspections that are consistent with the recommendations in the GALL Report, and that it will be effective to detect loss of material due to pitting and crevice corrosion for aluminum piping, piping components, and piping elements exposed to raw water in the auxiliary systems. Based on industry research and operating experience, the staff recognizes that aluminum is a corrosion resistant material that is not expected to experience significant loss of material in this environment. Therefore, the staff determined that the One-Time Inspection Program is appropriate for managing this aging effect. The staff's review and evaluation of the applicant's One-Time Inspection Program are On this basis, the staff finds the AMR results for this line item acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.13 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling [1]

LRA Table 3.3.1, Item 3.3.1-68, addresses loss of material due to general, pitting, crevice and MIC, and fouling for steel piping, piping components, and piping elements exposed to raw water in the auxiliary systems. The LRA credits the Fire Water System Program or the Fire Protection Program. The GALL Report recommends AMP XI.M27, "Fire Water System," to manage this aging effect. The Table 2 AMR line items crediting the Fire Protection Program in the LRA that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited. The LRA states that the Fire Protection Program manages loss of material for steel components on the fire diesel cooling water system.

The staff reviewed the applicant's Fire Water System Program and its evaluation is documented in SER Section 3.0.3.2.12. The staff confirmed that it includes activities that are consistent with the recommendations in the GALL AMP XI.M27. The staff determined that the applicant's Fire Water System Program includes tests and inspections of fire water system components that are appropriate for managing loss of material due to general, pitting, crevice and MIC, and fouling in the auxiliary systems. On this basis, the staff finds that AMR results addressed by this line item that credit the Fire Water System Program are acceptable.

The staff's evaluation of the applicant's Fire Protection Program is documented in SER Section 3.0.3.2.11. The staff determined that this aging management program includes diesel-driven fire pump inspections that require the pump and its driver be periodically tested and inspected to ensure that diesel engine subsystems can perform their intended functions. This verifies that the cooling water system, which is a subsystem of the diesel engine, will perform its function. The staff finds that these inspections will manage loss of material for steel components on the fire diesel cooling water system exposed to raw water such that the intended function of the components will not be affected. On this basis, the staff finds that AMR results addressed by this line item that credit the Fire Protection Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.14 Loss of Material due to General, Pitting, and Crevice Corrosion [3]

LRA Table 3.3.1, Item 3.3.1-71, addresses loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, an piping elements exposed to moist air or condensation (internal). The LRA credits the Periodic Surveillance and Preventive Maintenance Program or the One-Time Inspection Program. The GALL Report recommends AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," to manage

this aging effect. The Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited. The LRA credits this line item for components in the emergency diesel generator system and supporting subsystems that are exposed to untreated air.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluations are documented in SER Section 3.0.3.3.4. The staff determined that this program includes inspections of the EDG air intake components using visual and other proven NDE techniques that are appropriate for managing loss of material due to general, pitting, and crevice corrosion. The inspections are performed during the periodic system and component surveillances or during the performance of maintenance activities and any significant loss of material will be evaluated to determine if corrective actions are required or the frequency of inspections to be increased. On this basis, the staff finds that AMR results addressed by this line item that credit the Periodic Surveillance and Preventive Maintenance Program are acceptable.

During the audit and review, the staff asked the applicant to clarify how the One-Time Inspection Program will manage loss of material for steel components exposed to untreated air. In its response, the applicant stated that the LRA Table 2 line items referencing this Table 1 line item and crediting the one-time inspection are incorrect. The LRA will be amended to credit the Periodic Surveillance and Preventive Maintenance Program instead of the one-time inspection for these line items. In its letter dated February 1, 2007, the applicant amended the LRA Table 3.3.2-14-41 to credit the Periodic Surveillance and Preventive Maintenance Program for component types compressor housing, piping, and valve body that compare to GALL line Item 3.3.1-71. The staff finds this amendment acceptable since the Periodic Surveillance and Preventive Maintenance Program includes inspections that are acceptable to manage this aging effect.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.15 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion, Fouling, and Lining/Coating Degradation

LRA Table 3.3.1, Item 3.3.1-76, addresses loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, fouling, and lining/coating degradation for steel piping, piping components, and piping elements (without lining/coating or with degraded lining/coating) exposed to raw water. The LRA credits the Service Water Integrity Program or the Periodic Surveillance and Preventive Maintenance Program. The GALL Report recommends AMP XI.M20, " Open-cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items that reference this Table 1 line item and credit the Periodic Surveillance and Preventive Maintenance Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicant's Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes activities that are consistent with GALL AMP XI.M20. On this basis, the staff finds that AMR results addressed by this line item that credit the Service Water Integrity Program are acceptable.

During the audit and review, the staff asked the applicant to provide the technical justification for crediting the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect.

In its response, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program is credited for components that are not within the scope of the Service Water Integrity Program. The components for which the Periodic Surveillance and Preventive Maintenance Program is credited are in the radwaste and plant drains systems and are not exposed to service water. The raw water environment refers to untreated water, such as plant drains, that is not service water. The Periodic Surveillance and Preventive Maintenance Program includes periodic inspection of these components using visual inspection or other NDE techniques that will detect loss of material.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes periodic inspections of the radwaste and plant drains system components using visual and other proven NDE techniques that are appropriate for managing loss of material. The inspections are performed periodically and any significant loss of material will be evaluated to determine if corrective actions are required. The staff determined that these inspections are appropriate to monitor loss of material of radwaste and plant drains system components. On this basis, the staff finds that AMR results addressed by this line item that credit the Periodic Surveillance and Preventive Maintenance Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.16 Loss of Material due to General, Pitting, Crevice, and Microbiologically-Influenced Corrosion, and Fouling [2]

LRA Table 3.3.1, Item 3.3.1-77, addresses loss of material due to general, pitting, crevice, and microbiologically influenced corrosion, and fouling, for steel heat exchanger components exposed to raw water. The LRA credits the Service Water Integrity Program or the Periodic Surveillance and Preventive Maintenance Program. The GALL Report recommends AMP XI.M20, " Open-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items that references this Table 1 line item and credits the Periodic Surveillance and Preventive Maintenance Program cites Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicants Service Water Integrity Program and evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes activities that are consistent with the Open-Cycle Cooling Water System Program in the GALL Report. On this basis, the staff finds that AMR results addressed by this line item that credit the Service Water Integrity Program are consistent with the recommendations in the GALL Report, and are acceptable.

During the audit and review, the staff asked the applicant to provide the technical justification for crediting the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect.

In its response, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program is credited for components that are not within the scope of the Service Water Integrity Program. The components for which the Periodic Surveillance and Preventive Maintenance Program is credited are heat exchanger shells in the plumbing, and sanitary and lab systems that are not exposed to service water. The raw water environment refers to untreated water, such as plant drains, that is not service water. The Periodic Surveillance and Preventive Maintenance Program includes periodic inspection of these components using visual inspection or other NDE techniques that will detect loss of material.

The staff reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes inspections of the heat exchanger shells in the plumbing, sanitary and lab systems using visual and other proven NDE techniques that are appropriate for managing loss of material. The inspections are performed periodically and any significant loss of material will be evaluated to determine if corrective actions are required. The staff determined that these inspections are appropriate to monitor loss of material of heat exchanger shells in the plumbing, sanitary and lab systems. On this basis, the staff finds that the AMR results addressed by this line item that credit Periodic Surveillance and Preventive Maintenance Program is acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant’s results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.17 Loss of Material due to Pitting and Crevice Corrosion

LRA Table 3.3.1, item 3.3.1-79, addresses loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to raw water. The LRA credits the Service Water Integrity Program, One-Time Inspection Program, or the Periodic Surveillance and Preventive Maintenance Program. The GALL Report recommends AMP XI.M20, " Open-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items that reference this Table 1 line item and credit the One-Time Inspection or Periodic Surveillance and Preventive Maintenance Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicants Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes activities that are consistent with the Open-Cycle Cooling Water System Program in the GALL Report. On this basis, the staff finds that AMR results addressed by this line item that credit the Service Water Integrity Program are consistent with the recommendations in the GALL Report, and are acceptable.

During the audit and review, the staff asked the applicant to provide the technical justification for crediting the One-Time Inspection Program or the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect for components in the auxiliary systems.

In its response, the applicant stated that either the One-Time Inspection Program or Periodic Surveillance and Preventive Maintenance Program is credited for AMR line items in which the environment of raw water is used to identify untreated water, such as drain water, radwaste water, ventilation system drain water, potable water, and chemical treatment water. This water is not treated; however, it is also not service water and the components are not within the scope of the Service Water Integrity Program. The components for which the Periodic Surveillance and Preventive Maintenance Program is credited are primarily wetted and the material/environment is susceptible to aging degradation; therefore, periodic inspections are required to manage aging. The components for which the One-Time Inspection Program is credited have material/environment combinations that are not susceptible to aging; therefore a one-time inspection is appropriate to verify that no significant aging is occurring.

The staff reviewed the LRA and bases documents and determined that the components addressed by the AMR line items that credit the Periodic Surveillance and Preventive Maintenance Program are in the radwaste and plant drains system, and the service water system. The staff also reviewed the applicant’s Periodic Surveillance and Preventive Maintenance Program and determined that this program includes inspections of components in the radwaste and drains system, and the service water system, using visual and other proven NDE techniques that are appropriate for managing loss of material. The inspections are performed every 10 years for stainless steel drain tanks, and every five years for stainless steel components used in chemical treatment in the service water system. Any significant loss of material detected will be evaluated to determine if corrective actions are required. The staff finds these activities adequate to manage loss of material for these components. On this basis, the staff finds that the AMR results addressed by this line item that credit the Periodic Surveillance and Preventive Maintenance Program are acceptable.

The staff also reviewed the LRA and determined that the components addressed by the AMR line items that credit the One-Time Inspection Program are in the radwaste system, and raw water treatment system. The staff reviewed the applicant’s One-Time Inspection Program and determined that this program includes inspections of components in the radwaste system and the raw water treatment system, using visual and other proven NDE techniques that are appropriate for detecting loss of material. The inspections will be performed during the 10 year period immediately prior to entering the period of extended operation to confirm that no significant aging degradation is occurring in these components. Any significant loss of material detected will be evaluated to determine if corrective actions, including expansion of the inspection sample size, are required. On this basis, the staff finds that AMR line items addressed by this line item that credit the One-Time Inspection Program are acceptable.

On the bases of its review of AMR result lines as described in the preceding paragraphs and its comparison of the applicant's results to corresponding recommendations in the GALL Report, the staff finds that the applicant addressed the AEM appropriately as recommended by the GALL Report.

3.3.2.1.18 Loss of Material due to Pitting, Crevice, and Microbiologically Influenced Corrosion, and Fouling

LRA Table 3.3.1, item 3.3.1-81, addresses loss of material due to pitting, crevice, and microbiologically influenced corrosion for copper alloy piping, piping components, and piping elements exposed to raw water. The LRA credits the Service Water Integrity Program, One-Time Inspection Program, or the Periodic Surveillance and Preventive Maintenance Program. The GALL Report recommends AMP XI.M20, " Open-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items that reference this Table 1 line item and credit the One-Time Inspection or Periodic Surveillance and Preventive Maintenance Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicants Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes activities that are consistent with the Open-Cycle Cooling Water System Program in the GALL Report. On this basis, the staff finds that AMR results addressed by this line item that credit the Service Water Integrity Program are consistent with the recommendations in the GALL Report, and are acceptable.

During the audit and review, the staff asked the applicant to provide the technical justification for crediting the One-Time Inspection Program or the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect for components in the auxiliary systems. In its response, the applicant stated that either the One-Time Inspection Program or the Periodic Surveillance and Preventive Maintenance Program is credited for AMR line items in which the environment of raw water is used to identify untreated water, such as drain water, radwaste water, ventilation system drain water, potable water, and chemical treatment water. This water is not treated; however, it is also not service water and the components are not within the scope of the Service Water Integrity Program. The components for which the Periodic Surveillance and Preventive Maintenance Program is credited are primarily wetted and the material/environment is susceptible to aging degradation; therefore, periodic inspections are required to manage aging.

The staff reviewed the LRA and bases documents and determined that the components addressed by this AMR line items that credit the Periodic Surveillance and Preventive Maintenance Program are in the radwaste and plant drains system. The staff also reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and determined that this program includes inspections of components in the radwaste and drains system using visual and other proven NDE techniques that are appropriate for managing loss of material. The inspections are performed every 10 years for copper alloy floor drain cleanouts in drain lines. Any significant loss of material detected will be evaluated to determine if corrective actions are required. The staff finds these activities adequate to manage loss of material for these

components. On this basis, the staff finds that the AMR results addressed by this line item that credit the Periodic Surveillance and Preventive Maintenance Program are acceptable.

The staff also reviewed the LRA and bases documents and determined that the components addressed by this AMR line items that credit the One-Time Inspection Program are in the raw water treatment system, the plumbing, sanitary and lab system, and the city water system. The staff reviewed the applicant's One-Time Inspection Program and determined that this program includes inspections of components in these systems using visual and other proven NDE techniques that are appropriate for detecting loss of material. The inspections will be performed during the 10-year period immediately prior to entering the period of extended operation to confirm that no significant aging degradation is occurring in these components. Any significant loss of material detected will be evaluated to determine if corrective actions, including expansion of the inspection sample size, are required. The staff finds these activities acceptable to manage loss of material for these components since, based on industry research and operating experience, this material/environment combination is not susceptible to corrosion. In addition, the components exposed to drains are not continuously wetted, which further reduces their susceptibility to corrosion. On this basis, the staff finds that AMR results addressed by this line item that credit the One-Time Inspection Program are acceptable.

3.3.2.1.19 Reduction of Heat Transfer due to Fouling [2]

LRA Table 3.3.1, item 3.3.1-83, addresses reduction of heat transfer due to fouling for stainless steel and copper alloy heat exchanger tubes exposed to raw water. The LRA credits the Service Water Integrity Program, Fire Protection Program, or the Periodic Surveillance and Preventive Maintenance (PSPM) Program. The GALL Report recommends AMP XI.M20, " Open-Cycle Cooling Water System," to manage this aging effect. The Table 2 AMR line items that reference this Table 1 line item and credit the Fire Protection or Periodic Surveillance and Preventive Maintenance Program cite Generic Note E, indicating that the AMR line items are consistent with the GALL Report material, environment, and aging effect, but a different aging management program is credited.

The staff reviewed the applicants Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes activities that are consistent with the Open-Cycle Cooling Water System Program in the GALL Report. On this basis, the staff finds that AMR results addressed by this line item that credit the Service Water Integrity Program are consistent with the recommendations in the GALL Report, and are acceptable.

During the audit and review, the staff asked the applicant to provide the technical justification for crediting the Fire Protection Program or the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect for components in the auxiliary systems. In its response, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program is credited to manage fouling in copper alloy heat exchanger tubes for the control room chiller condenser that are exposed to service water in the HVAC systems. The Periodic Surveillance and Preventive Maintenance Program is credited since determination of heat transfer capability, which is necessary to detect fouling, is not performed in the Service Water Integrity Program. The Fire Protection Program is specified to manage fouling in copper alloy heat exchanger tubes exposed to system fire water used for fire pump diesel engine cooling.

The diesel fire pump cooling uses fire water from the lake as a cooling source. Testing of the cooling capacity of the heat exchanger is observed during pump testing in the Fire Protection Program and manages fouling of these components. The Service Water Integrity Program is not applicable to fire water used as a heat sink.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes performance tests of heat exchanger tubes in the HVAC systems that are appropriate for detecting a loss of heat transfer capability to managing fouling. The performance tests are performed every 5 years and any significant loss of heat transfer capability will be evaluated to determine if corrective actions are required. The staff finds these activities adequate to manage fouling for these components. On this basis, the staff finds that the AMR results addressed by this line item that credit the Periodic Surveillance and Preventive Maintenance Program are acceptable.

The staff also reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that this program includes performance tests of the diesel fire pump, which include observation of the engine cooling heat exchanger to determine cooling capacity. Any significant loss of heat transfer capacity detected will be evaluated to determine if corrective actions are required. The staff finds these activities acceptable to manage loss of material for these components since, monitoring heat transfer capacity is an effective means of managing fouling in heat exchanger tubes. On this basis, the staff finds that AMR results addressed by this line item that credit the Fire Protection Program are acceptable.

3.3.2.1.20 AMR Results Identified as Not Applicable

In LRA Table 3.3.1, line items 36, 39, 40, 41, 53, 54, 72, 75, 92, and 95 are identified as "Not Applicable" since the component/material/environment combination does not exist at JAFNPP. For each of these line items, the staff reviewed the LRA and the applicant's supporting bases documents, and confirmed the applicant's claim that the component/material/environment combination does not exist at JAFNPP. On the basis that JAFNPP does not have the component/material/ environment combination for these Table 1 line items, the staff finds that these AMRs are not applicable to JAFNPP.

3.3.2.1.21 AMR Results Identified as Not Used

In LRA Table 3.3.1, line items 42, 61, 63, 65, 66, 67, 73, 74, 80, and 86 are identified as "not used" since the component/material/environment combination is addressed by another Table 1 line item. For each of these line items, the staff reviewed the LRA and bases documents and confirmed that the line item was not used in the LRA. In addition, the staff confirmed that the aging effects addressed by these line items were addressed by other appropriate Table 1 AMR line items. On this basis, the staff finds the applicant's identification of these Table 1 AMR line items as "not used" acceptable.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review,

the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.3.2.2, the applicant provided further evaluation of aging management, as recommended by the GALL Report, for the auxiliary systems components. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- reduction of heat transfer due to fouling
- cracking due to stress corrosion cracking
- cracking due to stress corrosion cracking and cyclic loading
- hardening and loss of strength due to elastomer degradation
- reduction of neutron-absorbing capacity and loss of material due to general corrosion
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion
- loss of material due to general, pitting, crevice, microbiologically-influenced corrosion and fouling
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and galvanic corrosion
- loss of material due to pitting, crevice, and microbiologically-influenced corrosion
- loss of material due to wear
- loss of material due to cladding breach
- QA for aging management of nonsafey-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL 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 evaluation of the aging effects is discussed in the following sections.

3.3.2.2.1 Cumulative Fatigue Damage

The staff reviewed LRA Section 3.3.2.2.1 against the SRP-LR Section 3.3.2.2.1 criteria.

SRP-LR Section 3.3.2.2.1states that Fatigue is a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3. TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c)(1). This TLAA is addressed separately in Section 4.3, "Metal Fatigue Analysis," of SRP-LR.

The staff reviewed the applicant's TLAA on Metal Fatigue of Non-Class 1 Components in LRA Section 4.3.2.

During the audit and review, the applicant clarified that the piping and in-line components in Table 3.3.2-X including cyclone separators, drain pots, expansion joints, flow elements, mufflers, orifices, piping, rupture disks, steam traps, strainers, strainer housings, thermowells, T-quenchers, tubing and valve bodies are identified with a TLAA for fatigue, and are discussed in LRA Section 4.3.2. These components were designed to the applicable ASME Code Section III, Section VIII or ANSI B31.1 code. Since the TLAA remains valid per 10CFR54.21(c)(1)(I), no aging management program is required to manage the aging effect.

SER Section 4.3.2.2 documents the staff's review of the applicant's evaluation of this TLAA for Non-Class 1 components, including non-class 1 portions of the auxiliary systems.

In LRA Section 3.3.2.2.1, the applicant further states that where fatigue damage is identified as an aging effect requiring management for components with no fatigue design requirements (ASME or ANSI codes), the aging effect is managed by inspection. The Periodic Surveillance and Preventive Maintenance, Fire Protection, and One-Time Inspection Programs will manage cracking due to fatigue for these components. The staff reviewed each of these AMRs on a case-by-case basis to confirm that the aging management program credited is appropriate, and that the evaluation is included in this SER in the section corresponding to the components and systems addressed.

The staff noted that Table 3.3.1-1, line item 1 addresses cumulative fatigue damage for steel crane structural girders exposed to air-indoor uncontrolled (external). The LRA states that this line item was not used since cranes are treated as structural components. The staff confirmed that cranes are included in LRA Section 3.5 as structural components. The staff's evaluation of the AMR for cranes is included in Section 3.5 of this SER.

3.3.2.2.2 Reduction of Heat Transfer Due to Fouling

In LRA Section 3.3.2.2.2, the applicant addressed reduction of heat transfer due to fouling. The applicant stated that this is an aging effect requiring management for stainless steel heat exchanger tubes exposed to treated water. At JAFNPP there are no stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems with an intended function of heat transfer; therefore, this item is not applicable to JAFNPP.

The staff reviewed the LRA and confirmed that there are no stainless steel heat exchanger tubes exposed to treated water in the auxiliary systems.

On the basis that JAFNPP does not have any components subject to this aging effect, the staff finds that this further evaluation is not applicable to JAFNPP.

3.3.2.2.3 Cracking Due to Stress Corrosion Cracking

The staff reviewed LRA Section 3.3.2.2.3 against the SRP-LR Section 3.3.2.2.3 criteria.

(1) In LRA Section 3.3.2.2.3, Item 1, the applicant addressed cracking due to SCC in the stainless steel piping, piping components, and piping elements of the BWR standby liquid control (SLC) system that are exposed to sodium pentaborate solution greater than 140 °F. The applicant stated that at JAFNPP the sodium pentaborate solution in the SLC system does not exceed 140°F. Therefore, cracking due to SCC is not an aging effect requiring management for the SLC system and this item is not applicable to JAFNPP.

    The staff reviewed the LRA and bases documents and confirmed that the sodium pentaborate solution in the JAFNPP SLC system does not exceed 140°F. Therefore, the staff determines that cracking due to SCC is not an aging effect requiring management for the SLC system and that this item is not applicable to JAFNPP.

(2) In LRA Section 3.3.2.2.3, Item 2, the applicant addressed cracking due to SCC in stainless steel heat exchanger components exposed to treated water greater than 140°F. The applicant stated that this is an aging effect requiring management at JAFNPP. For JAFNPP auxiliary systems, these stainless steel heat exchanger components are managed by the Water Chemistry Control-BWR Program. This program monitors parameters and contaminants to ensure that they remain within the limits specified by the EPRI guidelines. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program for managing cracking using visual and ultrasonic inspection techniques.

    SRP-LR Section 3.3.2.2.3, Item 2, states that cracking due to SCC could 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 reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with recommendations in the GALL Report, and are adequate to manage cracking due to SCC in stainless steel heat exchanger components exposed to treated water greater than 140°F. The Water Chemistry Control-BWR Program monitors parameters and contaminants to ensure they remain within the limits specified by the EPRI guidelines, which will minimize the susceptibility of these components to cracking due to SCC. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.3, Item 2, for further evaluation.

(3) In LRA Section 3.3.2.2.3, Item 3, the applicant addressed cracking due to SCC in stainless steel diesel engine exhaust piping exposed to diesel exhaust. The applicant stated that cracking can occur when moisture collects inside the component when the diesel is not in operation. At JAFNPP, the stainless steel exhaust components are oriented vertically, which precludes pooling of water. Therefore, cracking due to SCC is not an aging effect requiring management for the stainless steel diesel engine exhaust piping, and this item is not applicable to JAFNPP.

SRP-LR Section 3.3.2.2.3, Item 3, states that cracking due to SCC could occur in stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

During the audit and review, the staff asked the applicant to justify why these components are not inspected to confirm that cracking is not occurring.

In its response, the applicant stated that inspection of the exhaust system components is included in the Periodic Surveillance and Preventive Maintenance Program; therefore, inspections will be performed every five years. The applicant committed to amend the LRA to revise the further evaluation in Section 3.3.2.2.3 to state that the PSPM Program will verify the absence of cracking in the exhaust system components. In its letter dated February 1, 2007, the applicant amended the LRA Section 3.3.2.2.3 to state that “This item is not applicable to JAFNPP.” is replaced by “However, the PSPM Program will verify the absence of cracking in the stainless steel exhaust components.” The staff finds acceptable the applicant's response since periodic inspections performed as part of the Periodic Surveillance and Preventive Maintenance Program will be effective to verify the absence of cracking in these components. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.3, Item 3, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.3. For those line items that apply to LRA Section 3.3.2.2.3, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.3.2.2.4 criteria.

(1) In LRA Section 3.3.2.2.4, Item 1, the applicant addressed cracking due to SCC and cyclic loading in stainless steel PWR nonregenerative heat exchanger components exposed to treated borated water greater than 140 °F in the chemical and volume control system. The applicant stated that JAFNPP is a BWR and does not have a nonregenerative heat exchanger exposed to treated borated water; therefore, this item is not applicable to JAFNPP.

The staff finds this section not applicable to JAFNPP because JAFNPP is a BWR plant and does not have these components.

(2) In LRA Section 3.3.2.2.4, Item 2, the applicant addressed cracking due to SCC and cyclic loading in stainless steel PWR regenerative heat exchanger components exposed to treated borated water greater than 140 °F. The applicant stated that JAFNPP is a BWR and does not have a regenerative heat exchanger exposed to treated borated water; therefore, this item is not applicable to JAFNPP.

The staff finds this section not applicable to JAFNPP because JAFNPP is a BWR plant and does not have these components.

(3) In LRA Section 3.3.2.2.4, Item 3, the applicant addressed cracking due to SCC and cyclic loading in the stainless steel pump casing of PWR high-pressure pumps in the chemical and volume control system. The applicant stated that JAFNPP is a BWR and does not have a chemical and volume control system; therefore, this item is not applicable to JAFNPP.

The staff finds this section not applicable to JAFNPP because JAFNPP is a BWR plant and does not have these components.

(4) In LRA Table 3.3.1, line item 10, the applicant addressed cracking due to SCC and cyclic loading in the high-strength steel closure bolting exposed to air with steam or water leakage in the auxiliary systems. The applicant stated that high-strength steel bolting is not used in the auxiliary systems at JAFNPP; therefore, this item is not applicable to JAFNPP.

The staff noted that this further evaluation was inadvertently omitted from Section 3.3.2.2.4 of the SRP-LR, Revision 1; however, it is addressed in Table 3.3-1, line item 10 of the SRP-LR. Consequently, the LRA does not include a separate section for this further evaluation; however, it is addressed in LRA Table 3.3-1, line item 10, which is consistent with the SRP-LR.

The staff reviewed the LRA and the supporting documentation and confirmed that high-strength steel closure bolting is not used in the JAFNPP auxiliary systems. On the basis that JAFNPP does not use high-strength steel bolting in the auxiliary systems subject to this aging effect, the staff finds that this further evaluation is not applicable to JAFNPP.

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 SRP-LR Section 3.3.2.2.5 criteria.

(1) In LRA Section 3.3.2.2.5, Item 1, the applicant addressed cracking and change in material properties due to elastomer degradation in elastomer flexible connections of auxiliary systems and other systems exposed to air – indoor. The applicant stated that these are aging effects requiring management at JAFNPP. These aging effects are managed by the Periodic Surveillance and Preventive Maintenance Program. This program includes visual inspections and physical manipulation of the flexible

connections to confirm that the components are not experiencing any aging that would affect accomplishing their intended functions.

SRP-LR Section 3.3.2.2.5, Item 1, states that hardening and loss of strength due to elastomer degradation could occur in elastomer seals and components of heating and ventilation systems exposed to air - indoor uncontrolled (internal/external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff reviewed the applicant's PSPM Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this aging management program includes visual inspections and physical manipulation of elastomeric connections to confirm that the components are not experiencing any aging that would affect accomplishing their intended functions. The staff determined that the Periodic Surveillance and Preventive Maintenance Program includes periodic inspections that are performed as part of routine plant surveillance and preventive maintenance activities. These inspections will detect degradation of elastomeric components in a timely manner such that corrective actions can be taken prior to a loss of component intended function. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.5, Item 1, for further evaluation.

(2) In LRA Section 3.3.2.2.5, Item 2, the applicant addressed hardening and loss of strength due to elastomer degradation in elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and cleanup systems exposed to treated water. The applicant stated that, for the auxiliary systems at JAFNPP no credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel material. The material is identified as carbon steel for the aging management review; therefore, this item is not applicable to JAFNPP.

SRP-LR Section 3.3.2.2.5, Item 2, states that hardening loss of strength due to elastomer degradation could occur in elastomer linings of the filters, valves, and ion exchangers in spent fuel pool cooling and cleanup systems (BWR and PWR) exposed to treated water or to treated borated water. The GALL Report recommends that a plant-specific AMP be evaluated to determine and assesses the qualified life of the linings in the environment to ensure that these aging effects are adequately managed.

The staff reviewed the LRA and bases documents and confirmed that no credit is taken for any elastomer linings to prevent loss of material from the underlying carbon steel material. The material is identified as carbon steel for the aging management review and appropriate aging management programs are credited to manage aging of these components.

On the basis that JAFNPP does not credit elastomer linings to prevent loss of material from the underlying carbon steel material any components subject to this aging effect, the staff finds that this further evaluation is not applicable to JAFNPP.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.5. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.3.2.2.6, the applicant addressed loss of material and cracking, and reduction of neutron absorbing capacity for Boral spent fuel storage racks exposed to a treated water environment. The applicant stated that loss of material and cracking are managed by the Water Chemistry Control-BWR Program. Reduction of neutron-absorbing capacity is insignificant and requires no aging management. The potential for aging effects due to sustained irradiation of Boral was previously evaluated by the staff (BNL-NUREG-25582, dated January 1979; NUREG-1787, VC Summer SER, paragraph 3.5.2.4.2, page 3-408) and determined to be insignificant. Plant operating experience with Boral coupons inspected in 2005 is consistent with the staff's conclusion and an aging management program is not required for this effect.

SRP-LR Section 3.3.2.2.6 states that reduction of neutron-absorbing capacity and loss of material due to general corrosion could occur in the neutron-absorbing sheets of BWR and PWR spent fuel storage racks exposed to treated water or to treated borated water. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

During the audit and review, the staff asked the applicant for additional information related to the testing of the Boral coupons and the results.

In its response, the applicant stated that in 2005, nine Boral coupons from JAFNPP spent fuel racks were subjected to nondestructive testing. The condition of the coupons included some localized pitting and blistering of the aluminum skin. The pitting was attributed to residual carbon steel chips left on the surface of the Boral during assembly of the capsules. The blisters were attributed to hydrogen formed by reaction between the pool water and internal surfaces of the aluminum. These conditions did not affect the intended function of the Boral. The areal densities determined by neutron attenuation measurements exceeded the minimum as-fabricated values in every case, which confirms that a reduction in neutron absorption capacity is not occurring. This testing is documented in the JAFNPP condition report.

The staff reviewed condition report and confirmed the applicant’s claim that reduction of neutron absorption is insignificant for the Boral coupons. The staff finds that reduction of neutron-absorbing capacity is insignificant and requires no aging management.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and its evaluation is documented in SER Section 3.0.3.1.10. The staff determined that this program includes activities that are consistent with recommendations in the GALL Report, and are adequate to manage loss of material and cracking for Boral spent fuel storage racks exposed to a treated water environment. The Water Chemistry Control-BWR Program monitors parameters and

contaminants to ensure they remain within the limits specified by the EPRI guidelines, which will minimize the susceptibility of these components to loss of material and cracking. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.6 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.6. For those line items that apply to LRA Section 3.3.2.2.6, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.2.7 Loss of Material Due to General, Pitting, and Crevice Corrosion

The staff reviewed LRA Section 3.3.2.2.7 against the SRP-LR Section 3.3.2.2.7 criteria.

(1) In LRA Section 3.3.2.2.7, Item 1, the applicant addressed 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 reactor coolant pump oil collection system exposed to lubricating oil. The applicant stated that steel piping and components in auxiliary systems at JAFNPP that are exposed to lubricating oil are managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program. The applicant further stated that JAFNPP is a BWR with an inert containment atmosphere and as a result has no reactor coolant pump oil collection system.

    SRP-LR Section 3.3.2.2.7, Item 1, states that loss of material due to general, pitting, and crevice corrosion could occur in steel piping, piping components, and piping elements, including the tubing, valves, and tanks in the reactor coolant pump oil collection system, exposed to lubricating oil (as part of the fire protection system). 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 control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation. In addition, corrosion may occur at locations in the reactor coolant pump oil collection tank where water from wash downs may accumulate.

Therefore, the effectiveness of the program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, and crevice corrosion, to include determining the thickness of the lower portion of the tank. A one-time inspection is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP. In its response dated February 1, 2007, the applicant amended the LRA Section 3.2.2.2.7, Item 1 to state "One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in the GALL Report, and is acceptable.

The staff reviewed the applicant's Oil Analysis Program and determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil.

The staff confirmed that since JAFNPP is a BWR with an inert containment atmosphere, it has no reactor coolant pump oil collection system. Therefore, aging of the tubing, valves, and tanks in the reactor coolant pump oil collection system are not applicable for JAFNPP.

The staff finds that the applicant's further evaluation is consistent with the recommendations in the SRP-LR. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.7, Item 1, for further evaluation.

(2) In LRA Section 3.3.2.2.7, Item 2, the applicant addressed loss of material due to general, pitting, and crevice corrosion in steel piping, piping components, and piping elements in the BWR reactor water cleanup and shutdown cooling systems exposed to treated water. The applicant stated that JAFNPP does not have a separate shutdown cooling system. Loss of material due to general, pitting, and crevice corrosion in carbon steel piping and components in other systems exposed to treated water are managed by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.3.2.2.7, Item 2, states that loss of material due to general, pitting, and crevice corrosion could occur in steel piping, piping components, and piping

elements in the BWR reactor water cleanup and shutdown cooling systems exposed to treated water. The existing AMP relies on monitoring and control of reactor water chemistry to manage the aging effects of loss of material from general, pitting, and crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause general, pitting, or crevice corrosion. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from general, pitting, and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined 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 treated water. The staff finds that the applicant's further evaluation is consistent with the recommendations in the SRP-LR. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.7, Item 2, for further evaluation.

(3) In LRA Section 3.3.2.2.7, Item 3, the applicant addressed loss of material due to general (steel only) pitting and crevice corrosion for steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. The applicant stated that this aging effect for carbon steel and stainless steel diesel exhaust piping and components exposed to diesel exhaust in the emergency diesel generator and security generator systems is managed by the Periodic Surveillance and Preventive Maintenance Program. This program uses visual and other NDE techniques to manage loss of material for these components. The carbon steel and stainless steel diesel exhaust piping and components in the fire protection system are managed by the Fire Protection Program. The Fire Protection Program uses visual inspections of diesel exhaust piping and components to manage loss of material. These inspections in the PSPM and Fire Protection Program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

SRP-LR Section 3.3.2.2.7, Item 3, states that loss of material due to general (steel only) pitting and crevice corrosion could occur for steel and stainless steel diesel exhaust piping, piping components, and piping elements exposed to diesel exhaust. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program uses visual and other NDE techniques to manage loss of material for carbon steel and stainless steel diesel exhaust piping and components in the fire protection system. The staff also reviewed the applicant's Fire Protection

Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that this program includes visual inspections of diesel exhaust piping and components to manage loss of material. The staff finds that the inspections performed in the Periodic Surveillance and Preventive Maintenance Program and Fire Protection Program will manage the aging effect of loss of material such that the intended function of the components will not be affected. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.7, Item 3, for further evaluation.

Based on the Programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.7. For those line items that apply to LRA Section 3.3.2.2.7, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.3.2.2.8, the applicant addressed loss of material due to general, pitting, crevice, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil in the auxiliary systems at JAFNPP. The applicant stated that this aging effect is managed by the Buried Piping and Tanks Inspection Program. This program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period. This program will manage the aging effect of loss of material such that the intended function of the components will not be affected.

SRP-LR Section 3.3.2.2.8 states that loss of material due to general, pitting, crevice corrosion, and MIC could occur for steel (with or without coating or wrapping) piping, piping components, and piping elements buried in 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, thus ensuring that loss of material would not be occurring.

The staff reviewed the applicant's Buried Piping and Tanks Inspection Program and its evaluation is documented in SER Section 3.0.3.2.1. The staff determined that this program includes opportunistic or focused inspections of buried components that are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, crevice, and MIC for carbon steel (with or without coating or wrapping) piping and components buried in soil. The staff confirmed that inspections will be performed both during the 10-year period immediately prior to the period of extended operation, as well as during the 10-year period after entering the period of extended operation, which is consistent

with the recommendations in the GALL Report.

During the audit and review, the staff asked the applicant for additional information on JAFNPP operating experience with buried components.

In its response, the applicant stated that a search of condition reports from the early 1990s to present identified only one incident in which a leak in a buried hydrogen supply line was evaluated. The root cause was determined to be poor application of the protective coating on the line, and was not aging related. Corrective actions were taken to replace the degraded section of buried piping. In addition, the applicant stated that during the period from the mid 1990s to present, several fire protection system buried valves were excavated and none showed any evidence of corrosion. Based on a review of JAFNPP plant-specific operating experience, the staff confirmed that opportunistic inspections of buried components are performed at JAFNPP, and loss of material on buried components that would lead to a loss of intended function during the period of extended operation is not occurring. The staff finds that the JAFNPP operating experience supports the use of the Buried Piping and Tanks Inspection Program as an effective means of managing aging of buried components.

Based on the program identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.8. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.3.2.2.9 criteria.

(1) In LRA Section 3.3.2.2.9, Item 1, the applicant addressed loss of material due to general, pitting, crevice, and MIC for carbon steel piping and components exposed to fuel oil. The applicant stated that this is an aging effect requiring management at JAFNPP and these components are managed by the Diesel Fuel Monitoring Program. This program includes sampling and monitoring of fuel oil quality to ensure they remain within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Ultrasonic inspection of storage tank bottoms where water and contaminants accumulate will be performed to confirm the effectiveness of the Diesel Fuel Monitoring Program. In addition, inspections of components during the previous five years at JAFNPP have confirmed the effectiveness of this program in lieu of a one-time inspection program, such that loss of material will not affect the intended functions of these components.

    SRP-LR Section 3.3.2.2.9, Item 1, states that loss of material due to general, pitting, crevice, MIC, and fouling could occur for steel piping, piping components, piping elements, and tanks 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 or fouling. Corrosion or fouling may occur at locations where

contaminants accumulate. The effectiveness of the fuel oil chemistry control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material due to general, pitting, crevice, MIC, and fouling to verify the effectiveness of the fuel oil chemistry program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Diesel Fuel Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.8. The staff determined that this program includes periodic sampling and analysis of diesel fuel to maintain contaminants within acceptable limits. The program also includes periodic draining, cleaning, and inspection of tanks to remove contaminants and verify the absence of significant degradation. The staff finds that these activities are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, crevice, and MIC for carbon steel piping and components exposed to fuel oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the inspections that are being credited in lieu of a one-time inspection include visual inspections of components at the most susceptible locations for components containing fuel oil, such as the bottom of tanks. If the inspection finds unacceptable results, they will be evaluated under the site corrective action program and the inspection population will be expanded. These inspections are performed periodically as part of routine maintenance. The staff finds that the use of a routine, periodic inspections and the performance of UT inspections of tank bottoms that are consistent with the one-time inspection program described in the GALL Report is acceptable to verify the effectiveness of the Diesel Fuel Monitoring Program.

The staff finds that the applicant's further evaluation is consistent with the recommendations in the SRP-LR. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.9, Item 1, for further evaluation.

(2) In LRA Section 3.3.2.2.9, Item 2, the applicant addressed loss of material due to general, pitting, crevice and MIC for carbon steel heat exchanger components exposed to lubricating oil. The applicant stated that this is an aging effect requiring management in the auxiliary systems at JAFNPP and is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.3.2.2.9, Item 2, states that loss of material due to general, pitting, crevice, MIC, and fouling could occur for steel heat exchanger components 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 control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lube oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP. In its response dated February 1, 2007, the applicant amended the LRA Section 3.2.2.2.7, Item 1 to state "One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in the GALL Report, and is acceptable.

The staff reviewed the applicant's Oil Analysis Program and One-Time Inspection Program its evaluations are documented in SER Sections 3.0.3.2.14 and 3.0.3.1.6, respectively. The staff determined that the Oil Analysis Program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to general, pitting, crevice and MIC for carbon steel heat exchanger components exposed to lubricating oil. The staff's finds that the One-Time Inspection Program activities are also consistent with the GALL report.

The staff finds that the applicant's further evaluation is consistent with the recommendations in the SRP-LR. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.9, Item 2, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.9. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.3.2.2.10 criteria.

(1) In LRA Section 3.3.2.2.10, Item 1, the applicant addressed loss of material due to pitting and crevice corrosion in steel piping with elastomer lining or stainless steel cladding that is exposed to treated water and treated borated water if the cladding or lining is degraded. The applicant stated that for the auxiliary systems at JAFNPP, no credit is taken for elastomer linings or stainless steel cladding to prevent loss of material from the underlying carbon steel material when exposed to treated water or treated borated water; the material is identified as carbon steel for the aging management review. The Water Chemistry Control-BWR Program manages loss of material in steel components exposed to treated water. The effectiveness of the program will be confirmed by the One-Time Inspection Program.

    SRP-LR Section 3.3.2.2.10, Item 1, states that loss of material due to pitting and crevice corrosion could occur in BWR and PWR steel piping with elastomer lining or stainless steel cladding that are exposed to treated water and treated borated water if the cladding or lining is degraded. The existing AMP relies on monitoring and control of reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause pitting, or crevice corrosion. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

    The staff reviewed the LRA and the bases documents and confirmed that no credit is taken for any elastomer linings in steel piping to prevent loss of material from the underlying carbon steel material. The material is identified as carbon steel for the aging management review and appropriate aging management programs are credited to manage aging of these components.

    The staff also reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined 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 steel piping that are exposed to treated water. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10, Item 1, for further evaluation.

(2) In LRA Section 3.3.2.2.10, Item 2, the applicant addressed loss of material due to pitting and crevice corrosion for 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 applicant stated that in the auxiliary systems at JAFNPP there are no aluminum components exposed to treated water. Loss of material due to pitting and crevice corrosion for stainless steel piping and components and for stainless steel heat exchanger components exposed to treated water in the auxiliary systems at JAFNPP is managed by the Water Chemistry Control-BWR Program. The effectiveness of the Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.3.2.2.10, Item 2, states that loss of material due to pitting and crevice corrosion could occur for 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 relies on monitoring and control of reactor water chemistry to manage the aging effects of loss of material from pitting and crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause pitting, or crevice corrosion. Therefore, the effectiveness of the chemistry control program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage loss of material from pitting and crevice corrosion to verify the effectiveness of the water chemistry program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component’s intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program, and determined 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 for stainless steel piping and components, and for stainless steel heat exchanger components exposed to treated water. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10, Item 2, for further evaluation.

(3) In LRA Section 3.3.2.2.10, Item 3, the applicant addressed loss of material due to pitting and crevice corrosion for copper alloy components exposed to condensation (external) in the HVAC and other systems. The applicant stated that this aging effect is managed by the External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance (PSPM), and Service Water Integrity Programs. The External Surfaces Monitoring Program includes a periodic visual inspection. The PSPM and Service Water Integrity Programs include visual inspections and other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

SRP-LR Section 3.3.2.2.10, Item 3, states that loss of material due to pitting and crevice corrosion could occur for copper alloy HVAC piping, piping components, and piping elements exposed to condensation (external). The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff reviewed the applicant’s External Surfaces Monitoring Program, Periodic Surveillance and Preventive Maintenance Program and Service Water Integrity Program and its evaluations are documented in SER Sections 3.0.3.2.9, 3.0.3.3.4, and 3.0.3.2.17, respectively. The staff determined that the External Surfaces Monitoring Program includes a periodic visual inspection of components that will be effective for detecting loss of material. Also, the Periodic Surveillance and Preventive Maintenance Program and Service Water Integrity Programs include visual inspections and other NDE techniques that will be effective to detect loss of material. The staff’s review and evaluation of the applicant's External Surfaces Monitoring Program, Periodic Surveillance and Preventive Maintenance Program and Service Water Integrity Program The staff finds that the aging management programs credited are acceptable to manage the aging effect of loss of material such that the intended function of the components will not be affected. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10, Item 3, for further evaluation.

(4) In LRA Section 3.3.2.2.10, Item 4, the applicant addressed loss of material due to pitting and crevice corrosion for copper alloy components exposed to lubricating oil in auxiliary systems at JAFNPP. The applicant stated that this aging effect is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.3.2.2.10, Item 4, states that loss of material due to pitting and crevice corrosion could occur for 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 control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component’s intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Oil Analysis Program and determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in the GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion for copper alloy piping, piping components, and piping elements exposed to lubricating oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP.

In its response dated February 1, 2007, the applicant amended the LRA Section 3.3.2.2.10, Item 4 to state "One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in the GALL Report, and is acceptable.

The staff finds that the applicant's further evaluation is consistent with the recommendations in the SRP-LR. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.10, Item 4, for further evaluation.

(5) In LRA Section 3.3.2.2.10, Item 5, the applicant addressed loss of material due to pitting and crevice corrosion for aluminum piping and components and stainless steel components exposed to condensation. The applicant stated that this is an aging effect requiring management for HVAC and other systems at JAFNPP. The Bolting Integrity, External Surfaces Monitoring, Periodic Surveillance and Preventive Maintenance and Service Water Integrity Programs will manage loss of material in aluminum or stainless steel components exposed internally or externally to condensation. These programs include a periodic visual inspection and the PSPM Program includes other NDE techniques to manage loss of material of the components.

SRP-LR Section 3.3.2.2.10, Item 5, states that loss of material due to pitting and crevice corrosion could occur for HVAC aluminum piping, piping components, and piping elements and stainless steel ducting and components exposed to condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

The staff reviewed the applicant's Bolting Integrity Program, External Surfaces Monitoring Program, Periodic Surveillance and Preventive Maintenance Program and Service Water Integrity Program and its evaluations are documented in SER Sections 3.0.3.2.20, 3.0.3.2.9, 3.0.3.3.4, and 3.0.3.2.17, respectively. The staff determined that the Bolting Integrity and External Surfaces Monitoring Programs include a periodic visual inspection of components that will be effective for detecting loss of material. Also, the Periodic Surveillance and Preventive Maintenance Program and Service Water Integrity Program include visual inspections and other NDE techniques that will be effective to detect loss of material. The staff finds that the aging management programs credited are acceptable to manage the aging effect of loss of material such that the intended function of the components will not be affected. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10, Item 5, for further evaluation.

(6) In LRA Section 3.3.2.2.10, Item 6, the applicant addressed loss of material due to pitting and crevice corrosion for copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The applicant stated that at JAFNPP, there are no copper alloy components exposed to condensation in the fire protection systems. However, this item can be applied to copper alloy components exposed to internal condensation in other systems. The Periodic Surveillance and Preventive Maintenance Program and One-Time Inspection Program will manage loss of material or confirm the aging effect is absent or insignificant in copper alloy components exposed internally to untreated air, which is equivalent to condensation, through the use of visual inspections or other NDE techniques.

SRP-LR Section 3.3.2.2.10, Item 6, states that loss of material due to pitting and crevice corrosion could occur for copper alloy fire protection system piping, piping components, and piping elements exposed to internal condensation. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that these aging effects are adequately managed.

During the audit and review, the staff asked the applicant to clarify when the Periodic Surveillance and Preventive Maintenance Program will be used to manage this aging effect, and when the One-Time Inspection Program will be used.

In its response, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program will be used for components requiring periodic inspection to manage aging effects. The One-Time Inspection Program is used for components where insignificant aging effects are expected, and confirmation that no significant aging is occurring is required. The staff finds this approach to be consistent with the function of these programs, and is acceptable.

The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and determined that it includes proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls that will be effective for managing loss of material due to pitting and crevice corrosion for copper alloy piping, piping components, and piping elements exposed to internal condensation. The staff also reviewed the applicant's One-Time Inspection Program and determined that it includes proven NDE inspection techniques that will be effective to verify that significant loss of material is not occurring. The staff finds that the programs credited are acceptable to manage this aging effect for the components addressed by this further evaluation. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10, Item 6, for further evaluation.

(7) In LRA Section 3.3.2.2.10, Item 7, the applicant addressed loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements exposed to soil. The applicant stated that at JAFNPP, there are no stainless steel piping components exposed to soil in the auxiliary systems; therefore, this item is not applicable to JAFNPP.

The staff reviewed the LRA and basis document and confirmed that there are no stainless steel piping components exposed to soil in the auxiliary systems. On the basis

that JAFNPP has no stainless steel piping components exposed to soil in the auxiliary systems, the staff finds this section not applicable to JAFNPP.

(8) In LRA Section 3.3.2.2.10, Item 8, the applicant addressed loss of material due to pitting and crevice corrosion for stainless steel piping, piping components, and piping elements of the BWR standby liquid control system that are exposed to sodium pentaborate solution. The applicant stated that this aging effect is managed at JAFNPP by the Water Chemistry Control-BWR Program. The effectiveness of the Water Chemistry Control-BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.3.2.2.10, Item 8, states that loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, and piping elements of the BWR standby liquid control system that are exposed to sodium pentaborate solution. The existing AMP relies on monitoring and control of water chemistry to manage the aging effects of loss of material due to pitting and crevice corrosion. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause loss of material due to pitting and crevice corrosion. Therefore, the GALL Report recommends that the effectiveness of the water chemistry control program should be verified to ensure this aging is not occurring. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that loss of material due to pitting and crevice corrosion is not occurring and that the component’s intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined 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 for stainless steel piping, piping components, and piping elements of the BWR standby liquid control system that are exposed to sodium pentaborate solution. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10, Item 8, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.10. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.3.2.2.11, the applicant addressed loss of material due to pitting, crevice, and galvanic corrosion for copper alloy piping, piping components, and piping elements exposed to treated water. The applicant stated that this aging effect is managed by the Water Chemistry Control-BWR Program. The effectiveness of the program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.3.2.2.11 states that loss of material due to pitting, crevice, and galvanic corrosion could occur for copper alloy piping, piping components, and piping elements exposed to treated water. Therefore, the GALL Report recommends that the effectiveness of the water chemistry control program should be verified to ensure this aging is not occurring. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that loss of material due to pitting and crevice corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined 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 galvanic corrosion for copper alloy piping, piping components, and piping elements exposed to treated water.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.11. For those line items that apply to LRA Section 3.3.2.2.11, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.3.2.2.12 criteria.

(1) In LRA Section 3.3.2.2.12, Item 1, the applicant addressed loss of material due to pitting, crevice, and MIC in stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to fuel oil. The applicant stated that this is an aging effect requiring management at JAFNPP and these components are managed by the Diesel Fuel Monitoring Program. There are no aluminum components exposed to fuel oil in the auxiliary systems. The Diesel Fuel Monitoring Program includes sampling and monitoring of fuel oil quality to ensure it remains within the limits specified by the ASTM standards. Maintaining parameters within limits ensures that significant loss of material will not occur. Inspections of components during the previous five years at JAFNPP have confirmed the effectiveness of this program in lieu of a one-time inspection program such that loss of material will not affect the intended functions of

these components.

SRP-LR Section 3.3.2.2.12, Item 1, states that loss of material due to pitting, crevice, and MIC could 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 is not occurring. 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 is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Diesel Fuel Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.8. The staff determined that this program includes periodic sampling and analysis of diesel fuel to maintain contaminants within acceptable limits. The program also includes periodic draining, cleaning, and inspection of tanks to remove contaminants and verify the absence of significant degradation. The staff finds that these activities 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 and copper alloy piping, piping components, and piping elements exposed to fuel oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the inspections that are being credited in lieu of a one-time inspection include visual inspections of components at the most susceptible locations for components containing fuel oil, such as the bottom of tanks. If the inspection finds unacceptable results, they will be evaluated under the site corrective action program and the inspection population will be expanded. These inspections are performed periodically. The staff finds that the use of routine, periodic inspections that are consistent with the one-time inspection program described in the GALL Report is acceptable to verify the effectiveness of the Diesel Fuel Monitoring Program. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.3.2.2.12, Item 1, for further evaluation.

(2) In LRA Section 3.3.2.2.12, Item 2, the applicant addressed loss of material due to pitting, crevice, and MIC in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The applicant stated that this aging effect is managed by the Oil Analysis Program which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these

components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.3.2.2.12, Item 2, states that loss of material due to pitting, crevice, and MIC could occur in stainless steel piping, piping components, and piping elements exposed to lubricating oil. The existing program relies on the periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. However, control of lube oil contaminants may not always have been adequate to preclude corrosion. Therefore, the effectiveness of lubricating oil control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Oil Analysis Program and determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities 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, piping components, and piping elements exposed to lubricating oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP. In its response dated February 1, 2007, the applicant amended the LRA Section 3.3.2.2.12, Item 2 to state "One-time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of a one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in the GALL Report, and is acceptable. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.2.2.2.12, Item 2, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.3.2.2.12. For those line items that apply to LRA Section 3.3.2.2.12, the staff determined that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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

In LRA Section 3.3.2.2.13, the applicant addressed loss of material due to wear in the elastomer seals and components exposed to air indoor uncontrolled (internal or external). The applicant stated that wear is the removal of surface layers due to relative motion between two surfaces. At JAFNPP, in the auxiliary systems, this specific aging effect for elastomers is not applicable since the expansion joints are fixed at both ends and do not contact any other components such that wear could occur. Where the aging effects of change in material properties and cracking are identified for elastomer components, they are managed by the Periodic Surveillance and Preventive Maintenance Program. This item is not applicable to JAFNPP auxiliary systems.

The staff reviewed the system descriptions in the LRA, along with the system design basis documents, and confirmed that there are no elastomeric components that are subject to wear in the JAFNPP auxiliary systems. On the basis that JAFNPP does not have elastomeric components subject to this aging effect, the staff finds that this further evaluation is not applicable to JAFNPP.

3.3.2.2.14 Loss of Material Due to Cladding Breach

In LRA Section 3.3.2.2.14, the applicant addressed loss of material due to cladding breach for PWR steel charging pump casings with stainless steel cladding exposed to treated borated water. The applicant stated that JAFNPP is a BWR and has no charging pumps; therefore, this item is not applicable to JAFNPP.

The staff finds this item not applicable to JAFNPP because JAFNPP is a BWR plant and does not have charging pumps.

3.3.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 provides the staff's evaluation of the applicant's QA program.

3.3.2.3 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.3.2-1 through 3.3.2-13 and 3.3.2-14-1 through 3.3.2-14-44, the staff reviewed additional details concerning the results of the AMRs for material, environment, AERM, and AMP combinations that are not consistent with the GALL Report, or that are not addressed in the GALL Report.

In LRA Tables 3.3.2-1 through 3.3.2-13, 3.3.2-14-5, 3.3.2-14-6, 3.3.2-14-9, 3.3.2-14-11, 3.3.2-14-12, 3.3.2-14-13, 3.3.2-14-15, 3.3.2-14-18, 3.3.2-14-23 through 3.3.2-14-41, 3.3.2-14-43, and 3.3.2-14-44, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information concerning how the aging effects will be managed. Specifically, Note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment

combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is discussed in the following sections.

3.3.2.3.1 Standby Liquid Control System Summary of Aging Management Evaluation – LRA Table 3.3.2-1

The staff reviewed LRA Table 3.3.2-1, which summarizes the results of AMR evaluations for the SLC system component groups.

The staff noted that LRA Table 3.2.2-1 includes an AMR line item to address stainless steel tanks in the SLC system exposed to air-indoor (internal). The AMR line item states that there are no aging mechanisms or effects for this material/ environment combination. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Also, based on current industry research and operating experience, the staff recognizes that this material/ environment combination is not susceptible to significant aging degradation. However, the staff noted that the GALL Report does address other components constructed of stainless steel that are exposed to air, indoor-uncontrolled for which no aging effect is noted (*e.g.,* Item EP-18 in Table V.F). In addition, based on industry operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the auxiliary systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds this AMR acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.2 Service Water Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-2

The staff reviewed LRA Table 3.3.2-2, which summarizes the results of AMR evaluations for the service water systems component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.3 Emergency Diesel Generator System Summary of Aging Management Evaluation – LRA Table 3.3.2-3

The staff reviewed LRA Table 3.3.2-3, which summarizes the results of AMR evaluations for the emergency diesel generator system component groups.

The staff noted that LRA Table 3.3.2-3 includes AMR line items to address an aluminum lubricator housing and motor housing in the EDG system exposed to air-untreated (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination.

In its response to the staff's inquiry regarding plant-specific operating experience for this material/environment combination, the applicant stated that a documented review of the past five years of operating experience did not identify any aging effects for components in the auxiliary systems with these material and environment combinations. The GALL Report identified other components constructed of aluminum in an indoor uncontrolled air environment exhibit no aging effect and that the component or structure will therefore remain capable of performing its intended functions consistent with the CLB for the period of extended operation. Aluminum has an excellent resistance to corrosion when exposed to humid air (an uncontrolled indoor environment). The aluminum oxide film is bonded strongly to its surface and that film, if damaged, reforms immediately in most environments. On a surface freshly abraded and then exposed to air, the oxide film is only 5 to 10 nanometers thick but is highly effective in protecting the aluminum from further corrosion. For this reason, the staff finds that aluminum exposed to indoor uncontrolled air environment does not require aging management.

The staff reviewed the applicant's plant-specific operating experience with components in the auxiliary systems containing this material and environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-3 includes an AMR line item to address aluminum valve bodies in the EDG system exposed to lubricating oil (internal). The AMR line item states that loss of material will be managed for this component under the Oil Analysis Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis to maintain lube oil purity, which is effective to manage loss of material.

In its response to the staff's inquiry regarding the use of one-time inspections to confirm the effectiveness of the Oil Analysis Program, the applicant stated that inspection activities will be added to the One-Time Inspection Program to verify the effectiveness of the Oil Analysis Program, and applicable LRA sections will be amended. In its letter dated February 1, 2007, the applicant amended LRA Section B1.21 to state that "Internal surfaces of components exposed to lube oil" implemented by One-time inspection activity will verify the effectiveness of the oil analysis program by confirming that unacceptable cracking, loss of material, and fouling is not

occurring to the Program Description section table of activities." The staff finds these activities acceptable to manage loss of material for aluminum valve bodies exposed to lubricating oil (internal). On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-3 includes an AMR line item to address aluminum heat exchanger fins exposed to air-indoor (external). The AMR line item credits the Periodic Surveillance and Preventive Maintenance Program to manage fouling for this component. The AMR cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes activities to perform EDG system heat exchanger maintenance and inspections, which include testing of heat exchanger performance and inspection of external surfaces to manage loss of material and fouling. The staff determined that these activities are adequate to manage fouling for aluminum heat exchanger fins exposed to air-indoor (external).On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-3 includes AMR line items to address copper alloy heat exchanger tubes exposed to air-indoor (external) in the EDG systems. The AMR line items credit the Periodic Surveillance and Preventive Maintenance Program to manage fouling and loss of material-wear for these components. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes activities to perform EDG heat exchanger chiller maintenance and inspection which includes testing of EDG heat exchanger performance and inspection of tube external surfaces to manage loss of material and fouling. The staff determined that these activities are adequate to manage loss of material-wear and fouling for copper alloy heat exchanger tubes exposed to air-indoor (external). On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-3 includes an AMR line item to address copper alloy heat exchanger tubes exposed to treated water (external) in the EDG system. The AMR credits the Service Water Integrity Program to manage loss of material-wear for these components. The AMR cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes periodic inspections per the requirements of GL 89-13, including eddy current testing, for heat exchangers to detect aging degradation.

In its response to the staff's inquiry, the applicant stated that the heat exchangers crediting the Service Water Integrity Program for aging management are cooled by the service water system and are therefore inspected per the requirements of GL 89-13 by the Service Water Integrity Program which manages the loss of material due to wear occurring on the external surfaces of the tubes by eddy current testing. The staff determined that these activities are adequate to manage loss of material-wear for copper alloy heat exchanger tubes exposed to treated water (external). On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-3 includes an AMR line item to address copper alloy heat exchanger tubes exposed to lubricating oil (external). The AMR line item credits the Heat Exchanger Monitoring Program to manage loss of material-wear for these components. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicants Heat Exchanger Monitoring Program and its evaluation of the applicant's Heat Exchanger Monitoring Program is documented in SER Section 3.0.3.3.1. The staff determined that this program includes eddy current testing of a representative sample of heat exchanger tubes to detect aging degradation. If degradation is found, an evaluation is performed to determine if corrective actions are necessary. The staff finds that these activities are adequate to manage loss of material-wear for heat exchanger tubes exposed to lubricating oil in the auxiliary systems since eddy current testing is a proven technique to detect wall thinning in tubes. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-3 includes an AMR line item to address a copper alloy strainer exposed to air-untreated (external) in the EDG system. The AMR line item states that there are no aging mechanisms or effects for this material and environment combination. The AMR cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. In its response dated April 24, 2007, the applicant revised LRA Table 3.3.2-3 to state that the component/material combination is consistent with the GALL Report line item VII.G-9 (AP-78) and the applicant's Periodic Surveillance and Preventive Maintenance Program will be used to manage the loss of material aging effect. The staff reviewed the Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The applicant's Periodic Surveillance and Preventive Maintenance Program is a plant-specific AMP which satisfies the criteria of SRP-LR Appendix A.1. This program includes periodic inspections and tests that manage aging effects not managed by other AMPs. The preventive maintenance and surveillance testing activities are generally implemented through repetitive tasks or routine monitoring of plant operations. On this basis, the staff finds that loss of material of copper alloy strainer exposed to air-untreated (external) in the EDG system will be adequately managed using the Periodic Surveillance and Preventive Maintenance Program. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-3 includes AMR line items to address stainless steel filter housings and valve bodies in the EDG system exposed to air-untreated (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note G, which indicates that this environment is not addressed in the GALL Report for this component and material combination. A Plant specific Note "301" is included in the LRA indicating that the environment for this component location is similar to an indoor air environment. The staff noted that the GALL Report does address other components constructed of stainless steel that are exposed to air, indoor-uncontrolled for which no aging effect is noted (*e.g.,* Item EP-18 in Table V.F). In addition, the staff reviewed the applicant's plant-specific operating experience with components in the EDG system containing these material/environment combinations and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-3 includes AMR line items to address stainless steel filter strainers in the EDG system exposed to lubricating oil (internal and external). The AMR line items credit the Oil Analysis Program to manage cracking of these components. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes activities to manage cracking of stainless steel strainers exposed to lubricating oil (internal and external).

In its response to the staff's inquiry to describe how the aging effect will be managed, the applicant stated that the Oil Analysis Program maintains oil systems free from contaminants thereby preserving an environment that is not conducive to loss of material, cracking, or fouling. Oil sampling frequencies are based on vendor recommendations, accessibility during plant operation, equipment importance, and previous test results. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-3 includes an AMR line item to address elastomer duct flexible connections in the EDG system exposed to air-indoor (internal). The AMR line item states that there are no aging mechanisms or effects for this material and environment combination. GALL Report volume 2, Item VII.F1-7 is cited which recommends a plant-specific aging management program. The AMR cites Generic Note I, which indicates that the aging effect in the GALL Report for this component, material, and environment combination is not applicable. A plant-specific note in the AMR states that changes of material properties and cracking in elastomers are the result of ultra-violet light or elevated temperature greater than 95ºF. However, the staff noted that elastomer duct flexible connections exposed to similar environments in other systems have been identified as being susceptible to aging and requiring aging management.

In its response to the staff's inquiry, the applicant responded that this AMR line item refers to the inner surface only of the EDG intake air duct flexible connection, which is neither exposed to temperature greater than 95 °F nor ultra-violet light. The exterior of this component, however, is susceptible to aging and is included in LRA Table 3.3.2.3 with the Periodic Surveillance and Preventive Maintenance Program credited to manage aging of this component. The staff finds the applicant's explanation acceptable since the inside surface of the flexible connector is not exposed to ultra-violet light or elevated temperature; therefore, the inside surface of the elastomer is not expected to degrade significantly. In addition, the outside surface of the connector will be inspected under the Periodic Surveillance and Preventive Maintenance Program ; therefore, degradation of the connector will be detected. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-3 includes AMR line items for carbon steel mufflers and piping and stainless steel expansion joints exposed to EDG exhaust gas (internal). The AMR line items state that cracking-fatigue of these components is managed as a TLAA - metal fatigue. The AMR line items for the stainless steel expansion joint cites Generic Note G, which indicates that this environment is not in the GALL Report for this component and material combination. The AMR line items for the carbon steel mufflers and piping cite Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. TLAAs are evaluated in Section 4.3 of this SER.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.4 Fuel Oil System Summary of Aging Management Evaluation – LRA Table 3.3.2-4

The staff reviewed LRA Table 3.3.2-4, which summarizes the results of AMR evaluations for the fuel oil system component groups.

The staff noted that LRA Table 3.3.2-4 includes an AMR line item to address loss of material for stainless steel bolting in the Fuel Oil system exposed to air-outdoor (external). The Bolting Integrity Program is credited to manage this aging effect. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Bolting Integrity Program and its evaluation is documented in SER Section 3.0.3.2.20. The staff determined that it includes inspections of bolting exterior surfaces that are effective for detecting a loss of material for this component. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-4 includes AMR line items to address aluminum flame arrestors in the Fuel Oil system exposed to air-outdoor (external) and air-outdoor (internal). The AMR line items state that there are no aging mechanisms or effects for this material/environment combination. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination.

In its response to the staff's inquiry about its operating experience, the applicant stated that no aging effects have been identified in the past for components with this material and environment combination and that this is consistent with industry (EPRI TR-1010639) operating experience. The staff noted that aluminum has an excellent resistance to corrosion when exposed to a humid air (outdoor environment). The aluminum oxide film is bonded strongly to its surface and, if damaged, reforms immediately in most environments. On a surface freshly abraded and then exposed to air, the oxide film is only 5 to 10 nanometers thick but is highly effective in protecting the aluminum from corrosion. Therefore, aluminum exposed to an outdoor air environment does not have any applicable aging effect. The staff reviewed the JAFNPP plant-specific operating experience with components in the auxiliary systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.5 Fire Protection - Water System Summary of Aging Management Evaluation – LRA Table 3.3.2-5

The staff reviewed LRA Table 3.3.2-5, which summarizes the results of AMR evaluations for the fire protection-water system component groups.

The staff noted that LRA Table 3.3.2-5 includes an AMR line item to address stainless steel bolting in the fire protection water systems exposed to air-outdoor (external). The AMR line item states that there are no aging mechanisms or effects for this material/ environment combination. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. In its response dated April 24, 2007, the applicant revised LRA Table 3.3.2-5 to state that the loss of material is the aging effect for stainless steel bolting in the fire protection water systems exposed to air-outdoor (external) and the Bolting Integrity Program will be used to manage this aging effect. The staff reviewed the applicant's Bolting Integrity Program and its evaluation is documented in SER Section 3.0.3.2.20. The staff determined that the applicant's Bolting Integrity Program is consistent with the GALL Report and it requires periodic visual and inservice inspections to manage the loss of material. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-5 includes AMR line items to address cracking-fatigue of stainless steel expansion joints, gray cast iron turbocharger housings, and carbon steel mufflers, valves, and piping, in the fire protection water system exposed to exhaust gas (internal). The AMR line items credits the Fire Protection Program to manage this aging effect. The AMR line items cite Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Fire Protection Program and determined that it includes periodic testing and inspection of the diesel driven fire pump to ensure that the engine and its subsystems are functioning properly. The staff finds that these inspections will be effective for detecting cracking for components exposed to exhaust gas. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-5 includes an AMR line item to address loss of material-wear for copper alloy heat exchanger tubes in the fire protection water system exposed to raw water (external). The AMR line item credits the Fire Protection Program to manage this aging effect. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that it includes periodic testing and inspection of the diesel driven fire pump to ensure that the engine and its subsystems are functioning properly. The staff finds that these inspections will be effective for detecting loss of material in the heat exchanger tubes. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-5 includes an AMR line item to address loss of material for aluminum heater housings in the fire protection water system exposed to treated water (internal). The AMR line item credits the Fire Protection Program to manage this aging effect. The AMR line item cites Generic Note G, which indicates that the environment is not addressed

in the GALL Report for this component and material combination. The AMR line item also includes a plant-specific note that states that the treated water is engine jacket cooling water. The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The staff determined that it includes periodic testing and inspection of the diesel driven fire pump to ensure that the engine and its subsystems are functioning properly. The staff finds that these inspections will be effective for detecting loss of material in the heater housings. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-5 includes AMR line items to address loss of material for carbon steel nozzles, strainer housings, tanks, valves, and piping in the fire protection water system exposed to fire protection foam (internal). The AMR line items credit the Fire Water System Program to manage this aging effect. The AMR line items cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.12. The staff determined that it includes periodic testing and inspection of the water-based fire protection systems, including nozzles, strainers, tanks, valves, and piping, in accordance with applicable National Fire Protection Association codes and standards to ensure functionality of all systems. The staff finds that these inspections will be effective for detecting loss of material in the nozzles. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-5 includes an AMR line item to address copper alloy nozzles in the fire protection water systems exposed to air-indoor (internal). The AMR line item states that there are no aging mechanisms or effects for this material/ environment combination. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff notes that copper alloy greater than 15-percent zinc in air-indoor internal environment has no aging effect. This conclusion is based on the fact that comprehensive tests conducted over a 20-year period under ASTM supervision have confirmed the suitability of copper and copper alloys for atmospheric exposure as cited in the *Metals Handbook*, Volume 13, “Corrosion” (American Society for Metals International, 1987). Also, based on industry research and operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff reviewed the JAFNPP plant-specific operating experience with components in the auxiliary systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-5 includes AMR line items to address loss of material for stainless steel strainers and copper alloy valve bodies in the fire protection water system exposed to fire protection foam (internal). The AMR line items credit the Fire Water System Program to manage this aging effect. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Fire Water System Program and its evaluation is documented in SER Section 3.0.3.2.12. The staff determined that it includes periodic testing and inspection of the water-based fire protection systems, including strainers and valves, in accordance with applicable National Fire Protection Association codes and standards to ensure functionality of all systems. The staff finds that these inspections will be effective for detecting

loss of material in these components. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-5 includes an AMR line item to address loss of material due to selective leaching of copper alloy valve bodies in the fire protection water system exposed to fire protection foam (internal). The AMR line item credits the Selective Leaching Program to manage this aging effect. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's Selective Leaching Program and its evaluation is documented in SER Section 3.0.3.1.7. The staff determined that it includes a one-time testing and hardness measurement of components susceptible to selective leaching to determine whether selective leaching is occurring. If selective leaching is detected, corrective actions will be taken. The staff finds that these inspections and hardness measurements will be effective for detecting loss of material due to selective leaching in these components. On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.6 Fire Protection - CO_2 System Summary of Aging Management Evaluation – LRA Table 3.3.2-6

The staff reviewed LRA Table 3.3.2-6, which summarizes the results of AMR evaluations for the fire protection-CO_2 system component groups.

The staff noted that LRA Table 3.3.2-6 includes AMR line items to address copper alloy and stainless steel tubing and valve bodies exposed to air-indoor. The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on industry operating experience, the staff recognizes that these material/environment combinations are not susceptible to significant aging degradation.

The staff also noted that stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which would be reflective of indoor uncontrolled air), as cited in *the Metals Handbook*, Volumes 3 (p. 65) and 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Components are not subject to moisture in a dry air environment (and indoor uncontrolled air would have limited humidity and condensation). Therefore, Stainless steel in an indoor, uncontrolled air environment exhibits no aging effect, and the component or structure will remain capable of performing its intended functions consistent with the CLB for the period of extended operation. For copper alloy greater than 15-percent zinc in air-indoor internal environment does not have any aging effect based on the fact that comprehensive tests conducted over a 20-year period under the supervision of ASTM have confirmed the suitability of copper and copper alloys for atmospheric exposure as cited in *Metals Handbook*, Volume 13, “Corrosion” (American Society for Metals International, 1987).

The staff reviewed the JAFNPP plant-specific operating experience with components in the auxiliary systems containing these material/environment combinations and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.7 Heating, Ventilation, and Air Conditioning Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-7

The staff reviewed LRA Table 3.3.2-7, which summarizes the results of AMR evaluations for the heating, ventilation, and air conditioning systems component groups.

The staff noted that LRA Table 3.3.2-7 includes AMR line items to address stainless steel filter housings, heat exchanger housings, orifices, piping, valve bodies, tubing, and pump casings exposed to air-indoor (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on current industry research and operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff also noted that stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which would be reflective of indoor uncontrolled air), as cited in *Metals Handbook*, Volumes 3 (p. 65) and 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Components are not subject to moisture in a dry air environment (and indoor uncontrolled air would have limited humidity and condensation). Therefore, stainless steel in an indoor, uncontrolled air environment exhibits no aging effect, and the component or structure will remain capable of performing its intended functions consistent with the CLB for the period of extended operation. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-7 includes AMR line items to address copper alloy valve bodies and tubing exposed to air-indoor (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff also noted that copper alloy greater than 15-percent zinc in air-indoor internal environment does not have any aging effect based on the fact that comprehensive tests conducted over a 20-year period under the supervision of ASTM have confirmed the suitability of copper and copper alloys for atmospheric exposure as cited in *Metals Handbook*, Volume 13, “Corrosion” (American Society for Metals International, 1987). The staff reviewed the JAFNPP plant-specific operating experience with components in the auxiliary systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function during the period of extended operation have been experienced. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-7 includes an AMR line item to address nickel alloy heat exchanger tubesheets exposed to gas (internal). The AMR line item states that there is no aging mechanisms or effect for this material/environment combination. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on industry operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff also noted that the GALL Report does address other components constructed of nickel alloy that are exposed to air, indoor-uncontrolled for which no aging effect is noted (*e.g.,* Item RP-03 in Table IV.E). Since the gas environment addressed in this AMR line item is inert gas, such as carbon dioxide or nitrogen, it is not expected to be more severe than uncontrolled indoor air; therefore, no aging effects are expected for nickel alloy exposed to gas. The staff reviewed the JAFNPP plant-specific operating experience with components in the auxiliary systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-7 includes an AMR line item to address loss of material for stainless steel heat exchanger housings exposed to air-outdoor (external). The AMR line item credits the External Surfaces Monitoring Program to manage loss of material for these components. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.9. The staff determined that this program includes periodic inspections of component external surfaces to detect aging degradation. The staff determined that these activities are adequate to manage loss of material for stainless steel heat exchanger housings exposed to air-outdoor (external). On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-7 includes AMR line items to address copper alloy heat exchanger tubes exposed to condensation (external) or gas (external) in the HVAC systems. The AMR line items credit the Service Water Integrity Program to manage loss of material-wear and fouling for these components. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination, or Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes periodic inspections as per the requirements of GL 89-13, including eddy current testing, for heat exchangers to detect aging degradation.

In its response to the staff's inquiry, the applicant stated that the heat exchangers crediting the Service Water Integrity Program for aging management are control room chiller condensers that use emergency service water as a heat sink and are therefore inspected per the requirements of GL 89-13 by the Service Water Integrity Program. The staff determined that these activities are adequate to manage loss of material-wear and fouling for copper alloy heat exchanger tubes exposed to condensation (external) or gas (external). On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-7 includes an AMR line item to address aluminum heat exchanger fins exposed to condensation (external). The AMR line item credits the Service Water Integrity Program to manage fouling for this component. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Service Water Integrity Program and its evaluation is documented in SER Section 3.0.3.2.17. The staff determined that this program includes activities to visually inspect components (heat exchanger fins) or verify the heat transfer capability of safety-related heat exchangers cooled by service water.

In its response to the staff's inquiry, the applicant stated that the heat exchangers referred to in this AMR line item are room coolers that are cooled by service water and are therefore included in their Service Water Integrity Program. These heat exchangers are either visually inspected or performance tested to detect fouling. The staff also determined that these activities are adequate to manage fouling for aluminum heat exchanger fins exposed to condensation (external). On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.3.2-7 includes AMR line items to address copper alloy heat exchanger tubes exposed to condensation (external) in the HVAC systems. The AMR line items credit the Periodic Surveillance and Preventive Maintenance Program to manage fouling and loss of material-wear for these components. The AMR line items for fouling of copper alloy heat exchanger tubes cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The AMR line items for loss of material-wear of copper alloy heat exchanger tubes cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes activities to perform HVAC chiller maintenance and inspection which includes testing of HVAC chiller performance and inspection of tube external surfaces to manage loss of material and fouling. The staff also determined that these activities are adequate to manage loss of material-wear and fouling for copper alloy heat exchanger tubes exposed to condensation (external). On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-7 includes AMR line items to address copper alloy heat exchanger tubes exposed to treated water (external) in the HVAC systems. The AMR line items credit the Periodic Surveillance and Preventive Maintenance Program to manage loss of material-wear for this component. The AMR line items cite Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination.

In its response to the staff's inquiry as to why the heat exchanger monitoring or water chemistry programs were not used to manage this aging effect, the applicant stated that this AMR line item refers to an evaporator and a water chemistry program alone would not be sufficient to manage loss of material due to wear on the external tube surfaces. The applicant further stated that the Periodic Surveillance and Preventive Maintenance Program was incorrectly credited, and instead the Heat Exchanger Monitoring Program should be credited for loss of material due to wear. The LRA will be amended to credit the Heat Exchanger Monitoring Program for these

AMR line items. In its letter dated February 1, 2007, the applicant amended the LRA Table 3.3.2-7 to state: "In the line items for heat exchanger (tubes) / Copper alloy / Gas (ext) / Loss of material – wear, “Periodic Surveillance and Preventive Maintenance” Program is changed to “Heat Exchanger Monitoring” Program." The staff reviewed the applicant's Heat Exchange Monitoring Program and its evaluation is documented in SER Section 3.0.3.3.1. The staff determined that it includes eddy current testing, which is a proven technique to detect and manage loss of material for heat exchangers in the HVAC systems. The staff also determined that these activities are adequate to manage loss of material-wear for copper alloy heat exchanger tubes exposed to treated water (external). On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.2.2-7 includes an AMR line item to address aluminum heat exchanger fins exposed to condensation (external). The AMR line item credits the Periodic Surveillance and Preventive Maintenance Program to manage fouling for this component. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes activities to perform HVAC chiller maintenance and inspection, which include testing of HVAC chiller performance and inspection of external surfaces to manage loss of material and fouling. The staff also determined that these activities are adequate to manage fouling for aluminum heat exchanger fins exposed to condensation (external). On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.8 Containment Purge, Containment Atmosphere Dilution and Post-Accident Sampling Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-8

The staff reviewed LRA Table 3.3.2-8, which summarizes the results of AMR evaluations for the containment purge, containment atmosphere dilution, and post-accident sampling systems component groups.

The staff noted that LRA Table 3.3.2-8 includes AMR line items to address stainless steel and aluminum components in the containment purge, containment atmosphere dilution and post-accident sampling systems exposed to liquid nitrogen (internal). The AMR line items state that there is no aging mechanisms or effect for this material/environment combination. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on current industry research and operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff noted that nitrogen is an inert material that does not react with other materials; therefore, it is not expected to result in degradation of stainless steel or aluminum, which are themselves corrosion resistant materials. The staff reviewed the JAFNPP plant-specific operating experience with components in the

auxiliary systems containing this material/environment combination and confirmed that no aging effects that would lead to the loss of intended function have been experienced. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-8 includes AMR line items to address aluminum and stainless steel heat exchanger coils exposed to condensation (external). The AMR line items credit the Periodic Surveillance and Preventive Maintenance Program to manage fouling for this component. The AMR line items cite Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that this program includes inspections of heat exchanger coil external surfaces using visual or other NDE techniques to manage fouling. These inspections are performed every four years. The staff also determined that these activities are adequate to manage fouling for aluminum and stainless steel heat exchanger coils exposed to condensation (external). On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.2.2-8 includes AMR line items to address stainless steel components in the containment purge, containment atmosphere dilution and post-accident sampling systems exposed to air-indoor (internal). The AMR line items state that there is no aging mechanisms or effect for this material/environment combination. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff noted that stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which would be reflective of indoor uncontrolled air), as cited in *the Metals Handbook*, Volumes 3 (p. 65) and 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Components are not subject to moisture in a dry air environment (and indoor uncontrolled air would have limited humidity and condensation). Therefore, stainless steel in an indoor, uncontrolled air environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation. On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-8 includes AMR line items to address carbon steel and stainless steel components in the containment purge, containment atmosphere dilution and post-accident sampling systems exposed to vacuum. The AMR line items state that there is no aging mechanisms or effect for this material/environment combination. The AMR line items include a plant-specific note that states that the vacuum is between the inner and outer walls of the liquid nitrogen tank. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on industry operating experience, the staff recognizes that the stainless steel/vacuum combination is not susceptible to significant aging degradation. For the carbon steel components, the vacuum environment essentially eliminates corrosion due to oxidation since there is little or no oxygen present; therefore, this material/environment is not expected to be susceptible to significant aging degradation. On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated

in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.9 Fuel Pool Cooling and Cleanup System Summary of Aging Management Evaluation – LRA Table 3.3.2-9

The staff reviewed LRA Table 3.3.2-9, which summarizes the results of AMR evaluations for the fuel pool cooling and cleanup system component groups.

The staff noted that LRA Table 3.3.2-9 includes an AMR line item to address cracking of aluminum/boron carbide neutron absorbers exposed to treated water (external). The AMR line item credits the Water Chemistry Control-BWR Program to manage this aging effect. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Water Chemistry Control-BWR Program and determined that this program contains chemistry control and monitoring activities to maintain high water purity, which is effective for managing cracking in components exposed to treated water.

In its response to the staff's inquiry on verifying the effectiveness of the Water Chemistry Control-BWR Program for managing this aging effect, the applicant stated that the One-Time Inspection Program will be used to verify the effectiveness of the water chemistry programs by confirming that unacceptable cracking is not occurring. The staff determined that the applicant's Water Chemistry Control-BWR Program and One-Time Inspection Program are adequate to manage the cracking of aluminum/boron carbide neutron absorbers exposed to treated water (external). On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.10 Service, Instrument, and Breathing Air Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-10

The staff reviewed LRA Table 3.3.2-10, which summarizes the results of AMR evaluations for the service, instrument, and breathing air systems component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.11 Reactor Building Closed Loop Cooling Water System Summary of Aging Management Evaluation – LRA Table 3.3.2-11

The staff reviewed LRA Table 3.3.2-11, which summarizes the results of AMR evaluations for the reactor building closed loop cooling water system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.12 Radwaste and Plant Drains Summary of Aging Management Evaluation – LRA Table 3.3.2-12

The staff reviewed LRA Table 3.3.2-12, which summarizes the results of AMR evaluations for the radwaste and plant drains component groups.

The staff noted that LRA Table 3.3.2-12 includes an AMR line item to address stainless steel piping in the Radwaste and Plant Drains system exposed to air-indoor (internal). The AMR line item states that there are no aging mechanisms or effects for this material/environment combination. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on current industry research and operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. Stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which would be reflective of indoor uncontrolled air), as cited in the *Metals Handbook*, Volumes 3 (p. 65) and 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Components are not subject to moisture in a dry air environment (and indoor uncontrolled air would have limited humidity and condensation). Therefore, stainless steel in an indoor, uncontrolled air environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-12 includes AMR line items to address fiberglass piping in the Radwaste and Plant Drains system exposed to air-indoor (internal) and air indoor (external) and fiberglass tanks in the Radwaste and Plant Drains system exposed to raw water (internal) and soil (external). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this component. Based on current industry research and operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation.

In its response to the staff's inquiry regarding plant-specific operating experience with these components, the applicant stated that its documented review of recent operating experience did not identify any degraded conditions or failures that would indicate the presence of aging effects for these fiberglass components. Based on current industry research and operating experience, the staff determined that fiberglass is a highly corrosion resistant material and is impervious to normal plant environments and is not susceptible to age degradation. On this basis, the staff finds the AMR results for these line items acceptable

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.13 Security Generator Summary of Aging Management Evaluation – LRA Table 3.3.2-13

The staff reviewed LRA Table 3.3.2-13, which summarizes the results of AMR evaluations for the security generator component groups.

The staff noted that LRA Table 3.3.2-13 includes an AMR line item to address cracking-fatigue of stainless steel expansion joints in the security generator system exposed to air-indoor (external). The AMR line item credits the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that it includes periodic inspections of components in the security generator system using visual or other NDE techniques that will be effective for detecting cracking. The inspections are performed every four years based on industry operating experience and vendor recommendations. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-13 includes AMR line items to address fouling and loss of material for copper alloy heat exchanger tubes exposed to air-indoor (external). The AMR line items credit the Periodic Surveillance and Preventive Maintenance Program to manage these aging effects for this component. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination, or Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and determined that it includes a yearly security generator operability test that will be effective for detecting fouling and loss of material for the heat exchanger coils. The staff determined that these activities are adequate to manage aging for these copper alloy heat exchanger tubes exposed to air-indoor (external). On this basis, the staff finds the AMR results for these line items acceptable.

The staff noted that LRA Table 3.3.2-13 includes an AMR line item to address cracking-fatigue of carbon steel piping and silencers in the security generator system exposed to exhaust gas (internal). The AMR line item credits the Periodic Surveillance and Preventive Maintenance Program to manage this aging effect. The AMR line item cites Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff determined that it includes periodic inspections of components in the security generator system using visual or other NDE techniques that will be effective for detecting cracking. The inspections are performed every four years based on industry operating experience and vendor recommendations. The staff finds these activities acceptable to manage aging of these components. On this basis, the staff finds the AMR results for this line item acceptable.

The staff noted that LRA Table 3.2.2-13 includes an AMR line item to address loss of material for copper alloy tubing exposed to air-outdoor (external). The AMR line item credits the External

Surfaces Monitoring Program to manage this aging effect for these components. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. The staff reviewed the applicant's External Surfaces Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.9. The staff determined that it includes periodic inspections of external surfaces for components in the security generator systems that will be effective for detecting loss of material for these components. The staff determined that these activities are adequate to manage aging for these copper alloy tubing components exposed to air-outdoor (external). On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.14 Standby Liquid Control System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-5

The staff reviewed LRA Table 3.3.2-14-5, which summarizes the results of AMR evaluations for the SLC system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.15 Reactor Water Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-6

The staff reviewed LRA Table 3.3.2-14-6, which summarizes the results of AMR evaluations for the reactor water cleanup system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.16 Reactor Building Closed Loop Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-9

The staff reviewed LRA Table 3.3.2-14-9, which summarizes the results of AMR evaluations for the reactor building closed loop cooling water system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.17 Process Radiation Monitors, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-11

The staff reviewed LRA Table 3.3.2-14-11, which summarizes the results of AMR evaluations for the process radiation monitors component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.18 Fuel Pool Cooling and Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-12

The staff reviewed LRA Table 3.3.2-14-12, which summarizes the results of AMR evaluations for the fuel pool cooling and cleanup system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.19 Radwaste System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-13

The staff reviewed LRA Table 3.3.2-14-13, which summarizes the results of AMR evaluations for the radwaste system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.20 Containment Purge/CAD/PASS System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-15

The staff reviewed LRA Table 3.3.2-14-15, which summarizes the results of AMR evaluations for the containment purge/CAD/PASS system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.21 Decay Heat Removal System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-18

The staff reviewed LRA Table 3.3.2-14-18, which summarizes the results of AMR evaluations for the decay heat removal system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.22 Turbine Building Closed Loop Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-23

The staff reviewed LRA Table 3.3.2-14-23, which summarizes the results of AMR evaluations for the turbine building closed loop cooling system component groups.

The staff noted that LRA Table 3.3.2-14-23 includes AMR line items to address plastic tanks in the TBCLC system exposed to air-indoor (external) and treated water (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this component. Based on current industry research and operating experience, the staff recognizes that this material/environment combination is not susceptible to significant aging degradation. The staff noted that air-indoor (external) and treated water (internal) on polyvinyl chloride (PVC)/ chlorinated PVC will not cause aging of concern during the period of extended operation because there are no stressors present

according to industry standards. Therefore, the staff concludes that there are no applicable aging effects requiring management for plastic tanks in the TBCLC system exposed to air-indoor (external) and treated water (internal).

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.23 Vacuum Priming and Air Removal System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-24

The staff reviewed LRA Table 3.3.2-14-24, which summarizes the results of AMR evaluations for the vacuum priming and air removal system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.24 Service/Instrument/Breathing Air System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-25

The staff reviewed LRA Table 3.3.2-14-25, which summarizes the results of AMR evaluations for the service/instrument/breathing air system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.25 Turbine Lube Oil System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-26

The staff reviewed LRA Table 3.3.2-14-26, which summarizes the results of AMR evaluations for the turbine lube oil system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.26 Secondary Plant Drains, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-27

The staff reviewed LRA Table 3.3.2-14-27, which summarizes the results of AMR evaluations for the secondary plant drains component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.27 Raw Water Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-28

The staff reviewed LRA Table 3.3.2-14-28, which summarizes the results of AMR evaluations for the raw water treatment system component groups, and determined that the applicant did

not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.28 Contaminated Equipment Drains, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-29

The staff reviewed LRA Table 3.3.2-14-29, which summarizes the results of AMR evaluations for the contaminated equipment drains component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.29 Service Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-30

The staff reviewed LRA Table 3.3.2-14-30, which summarizes the results of AMR evaluations for the service water system component groups.

The staff noted that LRA Table 3.3.2-14-30 includes AMR line items to address plastic tanks in the Service Water system exposed to air-indoor (external) and raw water (internal). The AMR line items state that there are no aging mechanisms or effects for these material/environment combinations. The AMR line items cite Generic Note F, which indicates that the material is not addressed in the GALL Report for this component. Based on current industry research and operating experience, the staff recognizes that this material and environment combination is not susceptible to significant aging degradation. The staff noted that air-indoor (external) and raw water (internal) on PVC/chlorinated PVC will not cause aging of concern during the period of extended operation because there are no stressors present according to industry standards. Therefore, the staff concludes that there are no applicable aging effects requiring management for plastic tanks in the Service Water system exposed to air-indoor (external) and raw water (internal). On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.30 Auxiliary Gas Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-31

The staff reviewed LRA Table 3.3.2-14-31, which summarizes the results of AMR evaluations for the auxiliary gas treatment system component groups.

The staff noted that LRA Table 3.3.2-14-31 includes AMR line items to address stainless steel duct in the Auxiliary Gas Treatment system exposed to air-indoor (internal). The AMR line items state that there are no aging mechanisms or effects for this material and environment combination. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in the GALL Report for this component and material combination. Based on current industry research and operating experience, the staff recognizes that this

material/environment combination is not susceptible to significant aging degradation. Stainless steels are highly resistant to corrosion in dry atmospheres in the absence of corrosive species (which would be reflective of indoor uncontrolled air), as cited in the *Metals Handbook*, Volumes 3 (p. 65) and 13 (p. 555) (Ninth Edition, American Society for Metals International, 1980 and 1987). Components are not subject to moisture in a dry air environment (and indoor uncontrolled air would have limited humidity and condensation). Therefore, stainless steel in an indoor, uncontrolled air environment exhibits no aging effect, and the component or structure will remain capable of performing intended functions consistent with the CLB for the period of extended operation. On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.31 Reactor Building Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-32

The staff reviewed LRA Table 3.3.2-14-32, which summarizes the results of AMR evaluations for the reactor building ventilation system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.32 Turbine Building Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-33

The staff reviewed LRA Table 3.3.2-14-33, which summarizes the results of AMR evaluations for the turbine building ventilation system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.33 Drywell Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-34

The staff reviewed LRA Table 3.3.2-14-34, which summarizes the results of AMR evaluations for the drywell ventilation and cooling system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.34 Administration Building Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-35

The staff reviewed LRA Table 3.3.2-14-35, which summarizes the results of AMR evaluations for the administration building ventilation and cooling system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J

involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.35 Screenwell/Water Treatment Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-36

The staff reviewed LRA Table 3.3.2-14-36, which summarizes the results of AMR evaluations for the screenwell/water treatment ventilation and cooling system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.36 Plumbing, Sanitary, and Lab, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-37

The staff reviewed LRA Table 3.3.2-14-37, which summarizes the results of AMR evaluations for the plumbing, sanitary, and lab component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.37 Fire Protection System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-38

The staff reviewed LRA Table 3.3.2-14-38, which summarizes the results of AMR evaluations for the fire protection system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.38 City Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-39

The staff reviewed LRA Table 3.3.2-14-39, which summarizes the results of AMR evaluations for the city water system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.39 Auxiliary Boiler and Accessories, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-40

The staff reviewed LRA Table 3.3.2-14-40, which summarizes the results of AMR evaluations for the auxiliary boiler and accessories component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.40 Emergency Diesel Generator, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-41

The staff reviewed LRA Table 3.3.2-14-41, which summarizes the results of AMR evaluations for the emergency diesel generator component groups.

The staff noted that LRA Table 3.2.2-14-41 includes AMR line items to address nonsafety-related carbon steel compressor housings, piping, and valve bodies in the EDG system that could affect safety-related systems exposed to air-untreated (internal). The AMR line items credit the One-Time Inspection Program to manage cracking-fatigue for these components. The AMR line items cite Generic Note H, which indicates that this aging effect is not addressed in the GALL Report for this component, material, and environment combination.

In its response to the staff's inquiry to explain how the one-time inspection will manage this aging effect throughout the period of extended operation, the applicant stated that the components in these AMR line items are included in-scope only for structural support of the safety-related components in the EDG air start subsystem. This aging effect was conservatively identified due to the potential for high temperature thermal cycling of the discharge piping. The one-time inspection will confirm through visual or NDE techniques that cracking is not occurring or is so insignificant that an ongoing aging management program is not warranted. If significant cracking is detected, corrective actions will be taken in accordance with the site corrective action program. The staff reviewed the applicant's One-Time Inspection Program and its evaluation is documented in SER Section 3.0.3.1.6. The staff determined that it includes inspections using visual or other NDE techniques that are effective for detecting cracking. Since these components are included in-scope only for structural support of the safety-related components in the EDG air start subsystem, and this aging effect was identified due to the potential for high temperature thermal cycling of the discharge piping, the staff finds that a one-time inspection to confirm that significant aging degradation is not occurring is acceptable. On this basis, the staff finds the AMR results for these line items acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.41 Sample System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-43

The staff reviewed LRA Table 3.3.2-14-43, which summarizes the results of AMR evaluations for the sample system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.42 Contaminated Equipment Drains, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-29

The staff reviewed LRA Table 3.3.2-14-29, which summarizes the results of AMR evaluations for the contaminated equipment drains component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.43 Service Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-30

The staff reviewed LRA Table 3.3.2-14-30, which summarizes the results of AMR evaluations for the service water system component groups.

For staff's evaluation, see Section 3.3.2.3.29.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.44 Auxiliary Gas Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-31

The staff reviewed LRA Table 3.3.2-14-31, which summarizes the results of AMR evaluations for the auxiliary gas treatment system component groups.

For staff's evaluation, see Section 3.3.2.3.30.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.45 Reactor Building Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-32

The staff reviewed LRA Table 3.3.2-14-32, which summarizes the results of AMR evaluations for the reactor building ventilation system component groups.

For staff's evaluation, see Section 3.3.2.3.31.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.46 Turbine Building Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-33

The staff reviewed LRA Table 3.3.2-14-33, which summarizes the results of AMR evaluations for the turbine building ventilation system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.47 Drywell Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-34

The staff reviewed LRA Table 3.3.2-14-34, which summarizes the results of AMR evaluations for the drywell ventilation and cooling system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.48 Administration Building Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-35

The staff reviewed LRA Table 3.3.2-14-35, which summarizes the results of AMR evaluations for the administration building ventilation and cooling system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.49 Screenwell/Water Treatment Ventilation and Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-36

The staff reviewed LRA Table 3.3.2-14-36, which summarizes the results of AMR evaluations for the screenwell/water treatment ventilation and cooling system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.50 Plumbing, Sanitary, and Lab, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-37

The staff reviewed LRA Table 3.3.2-14-37, which summarizes the results of AMR evaluations for the plumbing, sanitary, and lab component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.51 Fire Protection System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-38

The staff reviewed LRA Table 3.3.2-14-38, which summarizes the results of AMR evaluations for the fire protection system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.52 City Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-39

The staff reviewed LRA Table 3.3.2-14-39, which summarizes the results of AMR evaluations for the city water system component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.53 Auxiliary Boiler and Accessories, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-40

The staff reviewed LRA Table 3.3.2-14-40, which summarizes the results of AMR evaluations for the auxiliary boiler and accessories component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.54 Emergency Diesel Generator, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-41

The staff reviewed LRA Table 3.3.2-14-41, which summarizes the results of AMR evaluations for the emergency diesel generator component groups.

For staff's evaluation, see Section 3.3.2.3.40.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.3.2.3.55 Main Turbine Generator, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-42

The staff reviewed LRA Table 3.3.2-14-42, which summarizes the results of AMR evaluations for the main turbine generator component groups, and determined that the applicant did not include any AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.56 Sample System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-43

The staff reviewed LRA Table 3.3.2-14-43, which summarizes the results of AMR evaluations for the sample system component groups, and determined that the applicant did not include any

AMR results with Generic Notes F through J involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.3.2.3.57 Steam Seal System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-44

The staff reviewed LRA Table 3.3.2-14-44, which summarizes the results of AMR evaluations for the steam seal system component groups.

For staff's evaluation, see Section 3.4.2.1.

On the basis of its review, the staff finds that the applicant has appropriately evaluated the AMR results of material, environment, AERM, and AMP combinations 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 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).

3.4 Aging Management of Steam and Power Conversion Systems

This section of the SER documents the staff's review of the applicant's AMR results for the steam and power conversion system (S&PC) components and component groups of the following:

- Condensate storage system
- MS, turbine generator auxiliaries, and main condenser
- Miscellaneous systems within the S&PC system in-scope for 10 CFR 54.4(a)(2) (These S&PC subsystems are included in LRA Section 3.3, "Auxiliary Systems," but are evaluated in this section.)

3.4.1 Summary of Technical Information in the Application

In LRA Section 3.4, the applicant provided AMR results for the S&PC system components and component groups. In LRA Table 3.4.1, "Summary of Aging Management Programs for the S&PC System Evaluated in Chapter VIII of NUREG-1801," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the S&PC system components and component groups.

In LRA Tables 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, 3.3.2-14-21, 3.3.2-14-22, 3.3.2-14-42, and 3.3.2-14-44, the applicant provided results for component types associated with the following S&PC subsystems in-scope for 10 CFR 54.4(a)(2).

- MS system, nonsafety-related components affecting safety-related systems
- extraction steam system, nonsafety-related components affecting safety-related systems
- condensate system, nonsafety-related components affecting safety-related systems
- feedwater system, nonsafety-related components affecting safety-related systems
- feedwater heater vents and drains system, nonsafety-related components affecting safety-related systems
- circulating water system, nonsafety-related components affecting safety-related systems
- main turbine generator, nonsafety-related components affecting safety-related systems
- steam seal system, nonsafety-related components affecting safety-related systems

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.4.2 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 S&PC system components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 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 that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.4.2.2. The staff's audit evaluations are documented in SER Section 3.4.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and whether the aging

effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are documented 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.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the S&PC system components.

Table 3.4-1 includes a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.4, that are 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	AMP in LRA	Staff Evaluation
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-1)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21 (c)	TLAA	Consistent with GALL Report, which recommends further evaluation (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	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2)
Steel heat exchanger components exposed to treated water (3.4.1-3)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	None	Not applicable to BWRs
Steel piping, piping components, and piping elements exposed to treated water (3.4.1-4)	Loss of material due to general, pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2)
Steel heat exchanger components exposed to treated water (3.4.1-5)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel and stainless steel tanks exposed to treated water (3.4.1-6)	Loss of material due to general (steel only) pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7 and 3.4.2.2.2 for steel tanks)
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	Oil analysis Program (B.1.20) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.2)
Steel piping, piping components, and piping elements exposed to raw water (3.4.1-8)	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling	Plant specific	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.3)
Stainless steel and copper alloy heat exchanger tubes exposed to treated water (3.4.1-9)	Reduction of heat transfer due to fouling	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.4)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil (3.4.1-10)	Reduction of heat transfer due to fouling	Lubricating Oil Analysis and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.4)
Buried steel piping, piping components, piping elements, and tanks (with or without coating or wrapping) exposed to soil (3.4.1-11)	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Buried Piping and Tanks Surveillance or Buried Piping and Tanks Inspection	None	Not applicable (See SER Section 3.4.2.2.5)
Steel heat exchanger components exposed to lubricating oil (3.4.1-12)	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and ne-Time Inspection	Oil analysis Program (B.1.20)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, piping elements exposed to steam (3.4.1-13)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.6)
Stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water > 60°C (> 140°F) (3.4.1-14)	Cracking due to stress corrosion cracking	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program(B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.6)
Aluminum and copper alloy piping, piping components, and piping elements exposed to treated water (3.4.1-15)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	None	Not applicable (See SER Section 3.4.2.2.7)
Stainless steel piping, piping components, and piping elements; tanks, and heat exchanger components exposed to treated water (3.4.1-16)	Loss of material due to pitting and crevice corrosion	Water Chemistry and One-Time Inspection	Water Chemistry Control - BWR Program (B.1.29.2) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7)
Stainless steel piping, piping components, and piping elements exposed to soil (3.4.1-17)	Loss of material due to pitting and crevice corrosion	Plant specific	Buried Piping and Tanks Inspection Program (B.1.1)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7)
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	Oil analysis Program (B.1.20) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.7)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil (3.4.1-19)	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Lubricating Oil Analysis and One-Time Inspection	Oil analysis Program (B.1.20) and One-Time Inspection Program (B.1.21)	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.4.2.2.8)
Steel tanks exposed to air - outdoor (external) (3.4.1-20)	Loss of material/ general, pitting, and crevice corrosion	Aboveground Steel Tanks	None	Not applicable (See SER Section 3.4.2.1.2)
High-strength steel closure bolting exposed to air with steam or water leakage (3.4.1-21)	Cracking due to cyclic loading, stress corrosion cracking	Bolting Integrity	None	Not applicable (See SER Section 3.4.2.1.2)
Steel bolting and closure bolting exposed to air with steam or water leakage, air - outdoor (external), or air - indoor uncontrolled (external); (3.4.1-22)	Loss of material due to general, pitting and crevice corrosion; loss of preload due to thermal effects, gasket creep, and self-loosening	Bolting Integrity	Bolting Integrity Program (B.1.30)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.4.2.1)
Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water > 60°C (> 140°F) (3.4.1-23)	Cracking due to stress corrosion cracking	Closed-Cycle Cooling Water System	None	Not applicable (See SER Section 3.4.2.1.2)
Steel heat exchanger components exposed to closed cycle cooling water (3.4.1-24)	Loss of material due to general, pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	None	Not applicable (See SER Section 3.4.2.1.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Stainless steel piping, piping components, piping elements, and heat exchanger components exposed to closed cycle cooling water (3.4.1-25)	Loss of material due to pitting and crevice corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control - Auxiliary Systems Program (B.1.29.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.4.2.1)
Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water (3.4.1-26)	Loss of material due to pitting, crevice, and galvanic corrosion	Closed-Cycle Cooling Water System	Water Chemistry Control - Auxiliary Systems Program (B.1.29.1)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.4.2.1)
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	None	Not applicable (See SER Section 3.4.2.1.2)
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	External Surfaces Monitoring Program (B.1.11)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.4.2.1)
Steel piping, piping components, and piping elements exposed to steam or treated water (3.4.1-29)	Wall thinning due to flow-accelerated corrosion	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program (B.1.14)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.4.2.1)
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	None	Not applicable (See SER Section 3.4.2.1.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel heat exchanger components exposed to raw water (3.4.1-31)	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	None	Not applicable (See SER Section 3.4.2.1.2)
Stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water (3.4.1-32)	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Open-Cycle Cooling Water System	Periodic Surveillance and Preventive Maintenance Program (B.1.22)	Consistent with GALL Report, which recommends no further evaluation (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 microbiologically-influenced corrosion, and fouling	Open-Cycle Cooling Water System	None	Not applicable (See SER Section 3.4.2.1.2)
Steel, stainless steel, and copper alloy heat exchanger tubes exposed to raw water (3.4.1-34)	Reduction of heat transfer due to fouling	Open-Cycle Cooling Water System	None	Not applicable (See SER Section 3.4.2.1.2)
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	None	Not applicable (See SER Section 3.4.2.1.2)
Gray cast iron piping, piping components, and piping elements exposed to soil, treated water, or raw water (3.4.1-36)	Loss of material due to selective leaching	Selective Leaching of Materials	None	Not applicable (See SER Section 3.4.2.1.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, stainless steel, and nickel-based alloy piping, piping components, and piping elements exposed to steam (3.4.1-37)	Loss of material due to pitting and crevice corrosion	Water Chemistry	Water Chemistry Control - BWR Program (B.1.29.2)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.4.2.1)
Steel bolting and external surfaces exposed to air with borated water leakage (3.4.1-38)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Stainless steel piping, piping components, and piping elements exposed to steam (3.4.1-39)	Cracking due to stress corrosion cracking	Water Chemistry	None	Not applicable to BWRs
Glass piping elements exposed to air, lubricating oil, raw water, and treated water (3.4.1-40)	None	None	None	Consistent with GALL Report
Stainless steel, copper alloy, and nickel alloy piping, piping components, and piping elements exposed to air - indoor uncontrolled (external) (3.4.1-41)	None	None	None	Consistent with GALL Report
Steel piping, piping components, and piping elements exposed to air - indoor controlled (external) (3.4.1-42)	None	None	None	Not applicable (See SER Section 3.4.2.1.2)
Steel and stainless steel piping, piping components, and piping elements in concrete (3.4.1-43)	None	None	None	Consistent with GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, stainless steel, aluminum, and copper alloy piping, piping components, and piping elements exposed to gas (3.4.1-44)	None	None	None	Not applicable (See SER Section 3.4.2.1.2)

The staff's review of the S&PC system component groups followed one of several approaches. One approach, documented in SER Section 3.4.2.1, discusses the staff's review of the AMR results for components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in SER Section 3.4.2.2, discusses the staff's review of the 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, discusses the staff's review of the 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 that are credited to manage or monitor aging effects of the S&PC system components is documented in SER Section 3.0.3.

3.4.2.1 AMR Results That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.4.2.1, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the effects of aging related to the S&PC system components:

- Bolting Integrity Program
- Buried Piping and Tanks Inspection Program
- External Surfaces Monitoring Program
- One-Time Inspection Program
- Water Chemistry Control - BWR Program

In LRA Tables 3.4.2-1, 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, 3.3.2-14-21, 3.3.2-14-22, 3.3.2-14-42, and 3.3.2-14-44 the applicant provided a summary of AMRs for the S&PC system components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes describe how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E, which indicate that 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, aging effect, and aging management program. In addition, the AMP is consistent with the AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report and the 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, aging effect, and aging management program. In addition, the AMP takes some exceptions to the AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant is consistent with the AMP identified in the GALL Report 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 AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report that has the same material, environment, aging effect, and AMP as the component that was 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 AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report 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 a different AMP is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit and review of the information provided in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation is discussed below.

3.4.2.1.1 Loss of Material Due to General, Pitting, and Crevice Corrosion and Microbiologically-influenced Corrosion

In LRA Table 3.3.2-14-22, circulating water system, which cites Table 3.4.1, item 3.4.1-32, the applicant proposed to manage loss of material of stainless steel and copper alloy piping, piping components, and piping elements exposed to raw water using the Periodic Surveillance and Preventive Maintenance Program. However, the AMP recommended by the GALL Report for this AERM is GALL AMP XI.M20, "Open-Cycle Cooling Water System Program." The applicant included a reference to Note E to the associated Table 2 line items, indicating a different AMP is credited. In the discussion column in Table 3.4.1, Items 3.4.1-32, the applicant stated that the Periodic Surveillance and Preventive Maintenance Program manages loss of material for copper alloy components exposed to raw water through periodic visual inspections. The applicant also stated that there are no stainless steel components exposed to raw water with an intended function of pressure boundary in the S&PC system.

The staff reviewed the AMR result lines referring to Note E and determined that the component type, material, environment, and aging effect are consistent with those of the corresponding line of the GALL Report. The staff reviewed the applicant's Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER Section 3.0.3.3.4. The staff found the use of the Periodic Surveillance and Preventive Maintenance Program to manage loss of material of copper alloy piping, piping components, and piping elements exposed to raw water to be acceptable because the Periodic Surveillance and Preventive Maintenance Program detects leakage and manages material degradation through periodic visual inspections. The staff concludes that this AMP addressed the AEM as recommended by the GALL Report.
On the basis of its review, the staff finds that the applicant appropriately addressed the loss of material due to general, pitting and crevice corrosion and MIC for copper alloy piping, piping components, and piping elements exposed to raw water.

3.4.2.1.2 AMR Results Identified as Not Applicable

In LRA Table 3.4.1, line items 20, 21, 23, 24, 27, 30, 31, 33, 34, 35, 36, 42, and 44 are identified as "Not Applicable" since the component/material/ environment combination does not exist at JAFNPP. For each of these line items, the staff reviewed the LRA and the applicant's supporting documents, and confirmed the applicant's claim that the component/material/environment combination does not exist at JAFNPP. On the basis that JAFNPP does not have the component/material/ environment combination for these Table 1 line items, the staff finds that these AMRs are not applicable to JAFNPP.

Conclusion. The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.4.2.2, the applicant provided further evaluation of aging management, as recommended by the GALL Report, for the S&PC system components. The applicant provided information concerning how it will manage the following aging effects:

- cumulative fatigue damage
- loss of material due to general, pitting, and crevice corrosion
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion, and fouling
- reduction of heat transfer due to fouling
- loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion
- cracking due to stress corrosion cracking
- loss of material due to pitting and crevice corrosion
- loss of material due to pitting, crevice, and microbiologically-influenced corrosion
- loss of material due to general, pitting, crevice, and galvanic corrosion
- QA for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL 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 3.4.2.2. The staff's evaluation of the aging effects is discussed in the following sections.

3.4.2.2.1 Cumulative Fatigue Damage

In LRA Section 3.4.2.2.1, the applicant stated that fatigue is a TLAA, as defined in 10 CFR 54.3. Applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1).

The staff reviewed the AMR line items in the Type 2 AMR tables for the steam and power conversion system in which fatigue-induced damage (to which the AMR line items refer as "fatigue - cracking") was shown as an AERM and in which the "TLAA - Metal Fatigue" was credited as the basis for management of the aging effect. This SER will refer to these AMR line items in the Type 2 AMR tables for the steam and power conversion systems as "AMRs on Non-Class 1 Fatigue" and to the relevant TLAA as the "TLAA on Metal Fatigue of Non-Class 1 Components."

SER Section 4.3.2.2 documents the staff's review of the applicant's evaluation of this TLAA for Non-Class 1 components, including non-class 1 portions of the S&PC system.

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 SRP-LR Section 3.4.2.2.2 criteria.

(1) In LRA Section 3.4.2.2.2, the applicant stated that the loss of material due to general, pitting, and crevice corrosion for carbon steel piping, piping components, and tanks exposed to treated water and for carbon steel piping and components exposed to steam is an aging effect requiring management in the S&PC and other systems at JAFNPP and is managed by the Water Chemistry Control – BWR Program. The effectiveness of the Water Chemistry Control – BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program, including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion could occur for steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water and for steel piping, piping components, and piping elements exposed to steam. The existing aging management program relies on monitoring and control of water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the Water Chemistry Control Program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the Water Chemistry Control Program. A one-time inspection of select components and susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In the discussion column of Table 3.4.1, items 3.4.1-2, 3.4.1-4, and 3.4.1-6, the applicant stated that the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Control Program. However, for those line items in Tables 3.4.2-1, 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, 3.3.2-14-21, 3.3.2-14-42, and 3.3.2-14-44, where these Table 3.4.1 line items are referenced in the S&PC System, only the Water Chemistry Control – BWR Program is credited under Aging Management Programs. The staff noted that the Table 2 AMR line items, in the LRA, that reference this Table 1 line item cite Note 401, indicating that the effectiveness of the Water Chemistry Control - BWR Program will be verified by the One-Time inspection Program. The staff determined that the use of One-Time Inspection Program to verify the effectiveness of the water chemistry control program is consistent with the recommendations in GALL Report, and is acceptable.

The staff reviewed the applicant's Water Chemistry Control – BWR Program and its evaluation is documented in SER Section 3.0.3.1.10. The staff verified that this AMP included activities that monitor and control water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion consistent with GALL AMP XI.M2. In addition, the staff verified that the One-Time Inspection Program included inspection activities to verify the effectiveness of Water Chemistry Control Program to manage loss of material due to general, pitting, and crevice corrosion at

locations of stagnant flow conditions. On the basis that One-Time Inspection will be performed on the components, the staff determined that the Water Chemistry Control – BWR Program is appropriate for the AEMs identified and provides assurance that the AEMs will be effectively managed through the period of extended operation.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2, item 1, for further evaluation.

(2) In LRA Section 3.4.2.2.2, the applicant stated that loss of material due to general, pitting, and crevice corrosion in steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.4.2.2.2 states that loss of material due to general, pitting, and crevice corrosion could occur for steel 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 manage corrosion to verify the effectiveness of the Lubricating Oil Analysis Program. A One-Time Inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection Program AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection Program AMP. In its letter dated February 1, 2007 (Amendment 5 to the LRA), the

applicant revised the LRA Section 3.4.2.2.2, item 2, to state that "One time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of the one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable.

The staff finds that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2, item 2, for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.4.2.2.2. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 (MIC), and Fouling

The staff reviewed LRA Section 3.4.2.2.3 against the criteria in SRP-LR Section 3.4.2.2.3.

In LRA Section 3.4.2.2.3, the applicant stated that loss of material due to general, pitting, crevice, and MIC, and fouling in steel piping and components in the S&PC system exposed to raw water is managed by the Periodic Surveillance and Preventive Maintenance Program. The program includes visual inspections and other NDE techniques to manage loss of material of the components. These inspections will manage the aging effect of loss of material such that the intended function of the components will not be affected.

SRP-LR Section 3.4.2.2.3 states that loss of material due to general, pitting, crevice, and MIC, and fouling could occur in steel piping, piping components, and piping elements exposed to raw water. The GALL Report recommends further evaluation of a plant-specific Aging Management Program to ensure that these aging effects are adequately managed. Acceptance criteria are described in Branch Technical Position RLSB-1 (Appendix A.1 of SRP-LR)

The staff reviewed the specific components in the circulating water system (CWS) that are represented by four line items in Table 3.3.2-14-22, which reference Table 3.4.1, item 3.4.1-8 and credit the Periodic Surveillance and Preventive Maintenance Program. The staff reviewed the Periodic Surveillance and Preventive Maintenance Program and its evaluation is documented in SER. Section 3.0.3.3.4. The staff found that the applicant’s Periodic Surveillance and Preventive Maintenance Program includes using visual or other NDE techniques to inspect a representative sample of CWS to manage internal loss of material. The staff concludes that this AMP will assure detection of leakage before the loss of its intended function and that this AMP will adequately manage loss of material due to general, pitting, crevice, and MIC and fouling in steel piping, piping components, and piping elements exposed to raw water.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.4.2.2.3 for further evaluation. For those line items that apply to

LRA Section 3.4.2.2.3, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.4.2.2.4 criteria.

(1) In LRA Section 3.4.2.2.4, the applicant stated that reduction of heat transfer due to fouling could occur for stainless steel and copper alloy heat exchanger tubes exposed to treated water. The S&PC system at JAFNPP has no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. However, reduction of heat transfer is managed by the Water Chemistry Control - BWR Program for copper alloy heat exchanger tubes in the high pressure coolant injection system. The effectiveness of the Water Chemistry Control - BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

    However, the applicant stated that the S&PC system at JAFNPP have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. This item is not applicable to S&PC system at JAFNPP. The applicant also stated in the discussion column of the Table 3.4.1 that there are no stainless steel heat exchanger tubes exposed to treated water in the S&PC system. The components to which this line item applies are in the high pressure coolant injection system in Table 3.2.2-4.

    On the basis that JAFNPP does not have stainless steel heat exchanger tubes exposed to treated water in the S&PC system subject to this aging effect, the staff finds that this further evaluation is not applicable to JAFNPP.

(2) In LRA Section 3.4.2.2.4, the applicant stated that reduction of heat transfer due to fouling could occur for steel, stainless steel, and copper alloy heat exchanger tubes exposed to lubricating oil. However, the applicant stated that the S&PC system at JAFNPP have no heat exchanger tubes with an intended function of heat transfer and associated aging effect of fouling. This item is not applicable to JAFNPP.

    The applicant also stated in the discussion column of the Table 3.4.1 that there are no steel, stainless steel or copper alloy heat exchanger tubes exposed to lubricating oil with intended functions in the S&PC system.

    The staff verified that there are no Table 2 line items in the S&PC system that reference Table 3.4.1, Item 3.4.1-10.

On the basis that JAFNPP does not have any components from this group in the steam and power system, the staff found that for this component type, this aging effect/mechanism is not applicable to JAFNPP.

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 SRP-LR Section 3.4.2.2.5 criteria.

(1) In LRA Section 3.4.2.2.5, the applicant stated that loss of material due to general, pitting, and crevice corrosion and MIC could occur in carbon steel (with or without coating or wrapping) piping, piping components, piping elements and tank exposed to soil. The S&PC system at JAFNPP have no carbon steel components that are exposed to soil. This item is not applicable to JAFNPP.

The staff verified that there are no Table 2 line items in the S&PC system that reference Table 3.4.1, Item 3.4.1-11. On the basis that JAFNPP does not have any components from this group in the steam and power system, the staff finds that for this component type, this aging effect is not applicable to JAFNPP.

(2) In LRA Section 3.4.2.2.5, the applicant stated that loss of material due to general, pitting, and crevice corrosion and MIC for carbon steel heat exchanger components exposed to lubricating oil is an aging effect requiring management in the S&PC system at JAFNPP and is managed by the Oil Analysis Program. This program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.4.2.2.5 states that loss of material due to general, pitting and crevice corrosion, and MIC could occur in steel heat exchanger components 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 manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In the discussion column of Table 3.4.1, item 3.4.1-12, the applicant stated that loss of material in steel heat exchanger components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this GALL Report line item applies are included in-scope under criterion 10 CFR 54.4(a)(2) and listed in Table 3.3.2-14-42. However, for those line items in Table 3.3.2-14-42 where these Table 3.4.1 line items

are referenced in the S&PC System, only the Oil Analysis Program is credited under Aging Management Programs.

The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection Program AMP. In its letter dated February 1, 2007 (Amendment 5 to the LRA), the applicant revised the LRA Section 3.4.2.2.5, item 2, to state that "One time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of the one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable. The staff concludes that this AMP will assure detection of leakage before the loss of its intended function and that this AMP will adequately manage loss of material due to general, pitting, crevice, and MIC in steel heat exchanger components exposed to lubricating oil.

Based on the programs identified above, the staff finds that the applicant has met the criteria of SRP-LR Section 3.4.2.2.5 for further evaluation. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.4.2.2.6, the applicant stated that cracking due to SCC in stainless steel components exposed to steam or treated water is managed by the Water Chemistry Control - BWR Program. The effectiveness of the Water Chemistry Control - BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.4.2.2.6 states that cracking due to SCC could occur in the stainless steel piping, piping components, piping elements, tanks, and heat exchanger components exposed to treated water greater than 60 °C (>140 °F), and for stainless steel piping, piping components,

and piping elements exposed to steam. The existing AMP relies on monitoring and control of water chemistry to manage the effects of cracking due to SCC. However, high concentrations of impurities at crevices and locations of stagnant flow conditions could cause SCC. Therefore, the GALL Report recommends that the effectiveness of the Water Chemistry Control Program should be verified to ensure that SCC is not occurring. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that SCC is not occurring and that the component's intended function will be maintained during the period of extended operation.

In the discussion column of Table 3.4.1, items 3.4.1-13 and 3.4.1-14, the applicant stated that the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Control - BWR Program. However, for those line items in Tables 3.2.2-4, 3.2.2-5, 3.2.2-6, 3.3.2-14-1, 3.3.2-14-7, 3.3.2-14-14, 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, 3.3.2-14-21, and 3.3.2-14-44, where these Table 3.4.1 line items are referenced in the S&PC System, only the Water Chemistry Control – BWR Program is credited under Aging Management Programs, but a note "401" was added to indicate that the effectiveness of the Water Chemistry Control – BWR Program will be verified by the One-Time Inspection Program. The staff determined that the use of One-Time Inspection Program to verify the effectiveness of the Water Chemistry Control Program is consistent with the recommendations in GALL Report, and is acceptable.

The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with the recommendations in GALL Report, and are adequate to manage cracking due to SCC. On the basis that One-Time Inspection will be performed on the components, the staff determined that the Water Chemistry Control – BWR Program is appropriate for the AEMs identified and provides assurance that the AEMs will be effectively managed through the period of extended operation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.4.2.2.6 for further evaluation. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.4.2.2.7 criteria.

(1) In LRA Section 3.4.2.2.7, the applicant stated that loss of material due to pitting and crevice corrosion for stainless steel components exposed to treated water is managed by the Water Chemistry Control - BWR Program. The S&PC system at JAFNPP have no aluminum or copper alloy components with intended functions that are exposed to treated water. The effectiveness of the Water Chemistry Control - BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible

locations such as areas of stagnant flow.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion could occur for stainless steel, aluminum, and copper alloy piping, piping components and piping elements and for stainless steel tanks and heat exchanger components exposed to treated water. The existing AMP relies on monitoring and control of water chemistry to manage the effects of loss of material due to pitting, and crevice corrosion. However, control of water chemistry does not preclude corrosion at locations of stagnant flow conditions. Therefore, the GALL Report recommends that the effectiveness of the water chemistry program should be verified to ensure that corrosion is not occurring. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In the discussion column of Table 3.4.1, item 3.4.1-15, the applicant stated that there are no aluminum or copper alloy components with intended functions in the S&PC system. The staff verified that there are no Table 2 line items in the S&PC system that reference Table 3.4.1, Item 3.4.1-15. On the basis that JAFNPP does not have any components from this group in the steam and power system, the staff found that for this component type, this aging effect/mechanism is not applicable to JAFNPP.

In the discussion column of Table 3.4.1, item 3.4.1-16, the applicant stated that the One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Control - BWR Program. The applicant used Note "401" in Tables 3.4.2-1, 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, and 3.3.2-14-21 where these Table 3.4.1 line items are referenced in the S&PC system to indicate that the effectiveness of the Water Chemistry Control – BWR Program will be verified by the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff determined that these programs include activities that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion in stainless steel components exposed to treated water. The staff concluded that these AMPs will adequately manage loss of material due to pitting and crevice corrosion for stainless steel components exposed to treated water. On the basis that one-time inspection will be performed on the components to verify the effectiveness of Water Chemistry Control – BWR Program, the staff determined that the Water Chemistry Control – BWR Program is appropriate for the AEMs identified and provides assurance that the AEMs will be effectively managed through the period of extended operation.

Based on the programs identified above, the staff finds that the applicant has met the criteria of SRP-LR Section 3.4.2.2.7, Item 1, for further evaluation.

(2) In LRA Section 3.4.2.2.7, the applicant stated that loss of material due to pitting and

crevice corrosion for stainless steel piping and piping components exposed to soil environment is managed by the Buried Piping and Tanks Inspection Program. The Buried Piping and Tanks Inspection Program will include (a) preventive measures to mitigate corrosion and (b) inspections to manage the effects of corrosion on the pressure-retaining capability of buried carbon steel, copper alloy, gray cast iron, stainless steel components. Buried components will be inspected when excavated during maintenance. An inspection will be performed within ten years of entering the period of extended operation, unless an opportunistic inspection occurred within this ten-year period.

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. Acceptance criteria are described in Appendix A.1 of SRP-LR Branch Technical Position RLSB -1.

In the discussion column of Table 3.4.1, item 3.4.1-17, the applicant stated that the Buried Piping and Tanks Inspection Program manages loss of material in stainless steel components exposed to soil.

The staff reviewed the applicant's Buried Piping and Tanks Inspection Program and its evaluation is documented in SER Section 3.0.3.2.1. The staff determined that this program's opportunistic or focused inspections of buried components are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion for stainless steel piping and piping components exposed to soil environment. The staff confirmed that inspections will be performed both during the 10-year period immediately prior to the period of extended operation, as well as during the 10-year period after entering the period of extended operation, which is consistent with recommendations in GALL Report. On this basis, the staff finds that the applicant has met the criteria of SRP-LR Section 3.4.2.2.7, Item 2, for further evaluation.

(3) In LRA Section 3.4.2.2.7, the applicant stated that loss of material due to pitting and crevice corrosion for copper alloy piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubrication oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion, or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one time inspection to provide confirmation of the effectiveness of the Oil Analysis Program.

SRP-LR Section 3.4.2.2.7 states that loss of material due to pitting and crevice corrosion could occur for 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 manage corrosion to verify the effectiveness of the lube oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In the discussion section of Table 3.4.1, item 3.4.1-18, the applicant stated that loss of material in copper alloy components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this GALL Report line item applies are included in-scope under criterion 10 CFR 54.4(a)(2) and listed in Table 3.3.2-14-26. However, for those line items in Table 3.3.2-14-18 where this Table 3.4.1 line item is referenced in the Turbine Lube Oil System, only the Oil Analysis Program is credited under Aging Management Programs.

The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to pitting and crevice corrosion for copper alloy piping and components exposed to lubricating oil.

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection Program AMP. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.6.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection AMP. In its letter dated February 1, 2007 (Amendment 5 to the LRA), the applicant revised the LRA Section 3.4.2.2.7, item 3, to state that "One time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of the one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable.

The staff concludes that Oil Analysis Program and One-Time Inspection Program will assure detection of leakage before the loss of its intended function and that these AMPs will adequately manage loss of material of copper alloy piping, piping components, and piping elements exposed to lubricating oil

Based on the programs identified above, the staff finds that the applicant has met the criteria of SRP-LR Section 3.4.2.2.7. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended

functions will be maintained consistent with the CLB 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.

In LRA Section 3.4.2.2.8, the applicant stated that loss of material due to pitting, crevice, and MIC in stainless steel piping and components exposed to lubricating oil is managed by the Oil Analysis Program, which includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits, thereby preserving an environment that is not conducive to corrosion. During the past five years, many visual inspections of components containing lubricating oil have been performed during corrective and preventive maintenance activities. The visual inspections of these components would identify degraded conditions such as fouling, corrosion, or cracking that could be attributed to an ineffective Oil Analysis Program. These past inspections at JAFNPP serve in lieu of a one-time inspection to provide confirmation of the effectiveness of the Oil Analysis Program. The S&PC system at JAFNPP have no stainless steel heat exchanger components exposed to lubricating oil.

SRP-LR Section 3.4.2.2.8 states that loss of material due to pitting, crevice, and MIC could occur in stainless steel piping, piping components, piping elements, and heat exchanger components exposed to lubricating oil. 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 lubricating oil contaminants may not always have been adequate to preclude corrosion. Therefore, the effectiveness of lubricating oil contaminant control should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to manage corrosion to verify the effectiveness of the lubricating oil chemistry control program. A one-time inspection of selected components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

The staff reviewed the applicant's Oil Analysis Program and its evaluation is documented in SER Section 3.0.3.2.14. The staff determined that this program includes periodic sampling and analysis of lubricating oil to maintain contaminants within acceptable limits. The staff finds that these activities are consistent with the recommendations in GALL Report, and are adequate to manage loss of material due to general, pitting, and crevice corrosion for steel piping, piping components, and piping elements exposed to lubricating oil.

In the discussion column of Table 3.4.1, item 3.4.1-19, the applicant stated that the loss of material in stainless steel components exposed to lubricating oil is managed by the Oil Analysis Program. The components to which this GALL Report line item applies are included in-scope under criterion 10 CFR 54.4(a)(2) and listed in Table 3.3.2-14-42. However, for those line items in Table 3.3.2-14-42 where this Table 3.4.1 line item is referenced in the Main Turbine Generator System, only the Oil Analysis Program is credited under Aging Management Programs

During the audit and review, the staff asked the applicant to clarify whether the inspections credited in lieu of the one-time inspection are consistent with the GALL Report recommendations for the One-Time Inspection Program AMP.

In its response, the applicant stated that the LRA will be amended to add activities to confirm the effectiveness of the Oil Analysis Program to the One-Time Inspection Program AMP. The staff's evaluation of the One-Time Inspection Program is documented in SER Section 3.0.3.1.6. In its letter dated February 1, 2007 (Amendment 5 to the LRA), the applicant revised the LRA Section 3.4.2.2.8 to state that "One time Inspection Program activities will be utilized to confirm the effectiveness of the Oil Analysis Program." The staff finds that the use of the one-time inspection to verify the effectiveness of the oil analysis program is consistent with the recommendations in GALL Report, and is acceptable.

Based on the programs identified above, the staff finds that the applicant has met the criteria of SRP-LR Section 3.4.2.2.8. For those line items that apply to LRA Section 3.4.2.2.8, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.4.2.2.9, the applicant stated that loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control - BWR Program. The effectiveness of the Water Chemistry Control - BWR Program will be confirmed by the One-Time Inspection Program through an inspection of a representative sample of components crediting this program including susceptible locations such as areas of stagnant flow.

SRP-LR Section 3.4.2.2.9 states that loss of material due to general, pitting, crevice, and galvanic corrosion can occur for steel heat exchanger components exposed to treated water. The existing AMP relies on monitoring and control of water chemistry to manage the effects of loss of material due to general, pitting, and crevice corrosion. However, control of water chemistry does not preclude loss of material due to general, pitting, and crevice corrosion at locations of stagnant flow conditions. Therefore, the effectiveness of the Water Chemistry Control Program should be verified to ensure that corrosion is not occurring. The GALL Report recommends further evaluation of programs to verify the effectiveness of the Water Chemistry Control Program. A one-time inspection of select components at susceptible locations is an acceptable method to ensure that corrosion is not occurring and that the component's intended function will be maintained during the period of extended operation.

In the discussion section of Table 3.4.1, item 3.4.1-5, the applicant stated that the program is consistent with GALL Report. Loss of material in steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will be used to verify the effectiveness of the Water Chemistry Program. The components to which this GALL Report line item applies are included in-scope under

criterion 10 CFR 54.4(a)(2) and listed in Table 3.3.2-14-17 and Table 3.3.2-14-19. The applicant used Note "401" for those line items in Tables 3.3.2-14-17 and 3.3.2-14-19 where these Table 3.4.1 line items are referenced in the Extraction Steam and Condensate System to indicate that the effectiveness of the Water Chemistry Control – BWR Program will be verified by the One-Time Inspection Program.

The staff reviewed the applicant's Water Chemistry Control – BWR Program and One-Time Inspection Program and its evaluations are documented in SER Sections 3.0.3.1.10 and 3.0.3.1.6, respectively. The staff verified that Water Chemistry Control – BWR Program included activities that monitor and control water chemistry to manage the effects of loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water. In addition, the staff verified that the One-Time Inspection Program included inspection activities to verify the effectiveness of Water Chemistry Control Program to manage loss of material due to general, pitting, and crevice corrosion at locations of stagnant flow conditions. On the basis that one-time inspection will be performed on the components to verify the effectiveness of Water Chemistry Control-BWR Program, the staff concluded that these programs will adequately manage loss of material due to general, pitting, crevice, and galvanic corrosion for steel heat exchanger components exposed to treated water.

Based on the programs identified above, the staff finds that the applicant has met the criteria of SRP-LR Section 3.4.2.2.9. For those line items that apply to LRA Section 3.4.2.2.9, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 provides the staff's evaluation of the applicant's QA program.

3.4.2.3 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.4.2-1, 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, 3.3.2-14-21, 3.3.2-14-22, 3.3.2-14-42, and 3.3.2-14-44 the staff reviewed additional details concerning the results of the AMRs for material, environment, AERM, and AMP combinations that are not consistent with the GALL Report, or that are not addressed in the GALL Report.

In LRA Tables 3.4.2-1, 3.3.2-14-16, 3.3.2-14-17, 3.3.2-14-19, 3.3.2-14-20, 3.3.2-14-21, 3.3.2-14-22, 3.3.2-14-42, and 3.3.2-14-44, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information concerning how the aging effects will be managed. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not

applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is discussed in the following sections.

3.4.2.3.1 Condensate Storage System Summary of Aging Management Evaluation – LRA Table 3.4.2-1

The staff reviewed LRA Table 3.4.2-1, which summarizes the results of AMR evaluations for the condensate storage system component groups.

LRA Table 3.4.2-1 states that the AMR line items for the condensate storage system are consistent with the GALL Report with the exception of three line items. Two line items consist of stainless steel material and component type - tank, piping, and screen exposed to air-outdoor (external) and one line item consists of stainless steel material and component type - screen and piping exposed to condensation (internal). The AMR line items cite Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. In LRA Table 3.4.2-1, the applicant proposed to manage loss of material for stainless steel components types exposed to air-outdoor (external) environment using External Surfaces Monitoring Program and Bolting Integrity Program.

The staff reviewed the applicant's External Surfaces Monitoring Program and Bolting Integrity Program and its evaluations are documented in SER Sections 3.0.3.2.9 and 3.0.3.2.20, respectively. The staff determined that these programs include a periodic visual inspection of components that will be effective for detecting loss of material. These programs are consistent with GALL AMPs XI.M36 and XI.M18, respectively and are adequate to manage loss of material for stainless steel components types exposed to air-outdoor (external) environment. On this basis, the staff finds the AMR results for these line items acceptable.

In LRA Table 3.4.2-1, the applicant proposed to manage loss of material for stainless steel components exposed to condensation (internal) environment using Water Chemistry Control - BWR Program. The AMR line item cites Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The staff reviewed the applicant's Water Chemistry Control-BWR Program and its evaluation is documented in SER Section 3.0.3.1.10. The staff determined that this program includes activities that are consistent with the recommendations in GALL Report, and are adequate to manage loss of material for stainless steel components due to pitting and crevice corrosion exposed to environment such as treated water and condensation (internal). On this basis, the staff finds the AMR results for this line item acceptable.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent

with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.2 Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-16

The staff reviewed LRA Table 3.3.2-14-16, which summarizes the results of AMR evaluations for the main steam system component groups. LRA Table 3.3.2-14-16 states that the AMR line items for the main steam system are consistent with the GALL Report with the exception of two line items. The two line items consist of stainless steel material and component type tubing and thermowell exposed to steam (internal). The applicant identified TLAA - metal fatigue as aging effect requiring management.

SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA. For other line items the staff confirmed that the AMR results presented in this table are consistent with the GALL Report. The staff's evaluation for AMR items that are consistent with the GALL Report is documented in SER Section 3.4.2.1.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.3 Extraction Steam System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-17

The staff reviewed LRA Table 3.3.2-14-17, which summarizes the results of AMR evaluations for the extraction steam system component groups.

LRA Table 3.3.2-14-17 states that the AMR results for the extraction steam system are consistent with the GALL Report with the exception of six line items. The six line items consist of stainless steel material and component type tubing, valve body, orifice, thermowell, flow element, and expansion joint exposed to steam (int). The applicant identified TLAA - metal fatigue as aging effect requiring management.

SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA. For other line items the staff confirmed that the AMR results presented in this table are consistent with the GALL Report. The staff's evaluation for AMR line items that are consistent with the GALL Report is documented in SER Section 3.4.2.1.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.4 Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-19

The staff reviewed LRA Table 3.3.2-14-19, which summarizes the results of AMR evaluations for the condensate system component groups.

LRA Table 3.3.2-14-19 states that the AMR results for the condensate system are consistent with the GALL Report with the exception of seven line items. Three line items are identified with stainless steel material, and component types - piping, bolting, and orifice exposed to air-outdoor (external) environment. The AMR line items cite Generic Note G, which indicates that the environment is not addressed in GALL Report for this component and material combination. The applicant identified loss of material as the aging effect requiring management and the External Surfaces Monitoring Program (for stainless steel, components types - piping and orifices) and Bolting Integrity Program (for stainless steel components type - bolting) as the programs for managing the aging effect.

The staff reviewed the applicants External Surfaces Monitoring Program and Bolting Integrity Program and its evaluations are documented in SER Sections 3.0.3.2.9 and 3.0.3.2.20, respectively. The staff determined that these programs include a periodic visual inspection of components that will be effective for detecting loss of material. On this basis, the staff finds the AMR results for these line items acceptable.

The other four line items consist of stainless steel material, component type - tubing, piping, valve body, and thermowell exposed to steam (internal) environment. The applicant identified cracking-fatigue as the aging effect requiring management. The applicant proposed to manage cracking-fatigue for these components using TLAA - metal fatigue. The staff reviewed the applicant's TLAA on Metal Fatigue of Non-Class 1 Components in LRA Section 4.3.2. SER Section 4.3.2 documents the staff's review of the applicant's evaluation of this TLAA.

For other line items, the staff confirmed that the AMR results presented in this table are consistent with the GALL Report. The staff's evaluation for AMR items that are consistent with the GALL Report is documented in SER Section 3.4.2.1.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.5 Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-20

The staff reviewed LRA Table 3.3.2-14-20, which summarizes the results of AMR evaluations for the feedwater system nonsafety-related component groups affecting safety-related systems and determined that the applicant did not include any AMR results with Generic Notes F through J involving material environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.4.2.3.6 Feedwater Heater, Vents, and Drains System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-21

The staff reviewed LRA Table 3.3.2-14-21, which summarizes the results of AMR evaluations for the feedwater heater, vents, and drains system nonsafety-related component groups affecting safety-related systems. LRA Table 3.3.2-14-21 states that the AMR results for the feedwater heater vents and drains system are consistent with the GALL Report with the exception of three line items. The three line items consist of stainless steel material and component type - tubing, orifice, and thermowell exposed to steam (internal). The applicant identified TLAA - metal fatigue as aging effect requiring management.

SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA. For other line items the staff confirmed that the AMR results presented in this table are consistent with the GALL Report. The staff's evaluation for AMR line items that are consistent with the GALL Report is documented in SER Section 3.4.2.1.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.2.3.7 Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-22

The staff reviewed LRA Table 3.3.2-14-22, which summarizes the results of AMR evaluations for the circulating water system nonsafety-related component groups affecting safety-related systems and determined that the applicant did not include any AMR results with Generic Notes F through J involving material environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.4.2.3.8 Main Turbine Generator, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-42

The staff reviewed LRA Table 3.3.2-14-42, which summarizes the results of AMR evaluations for the main turbine generator circulating water system nonsafety-related component groups affecting safety-related systems and determined that the applicant did not include any AMR results with Generic Notes F through J involving material environment, AERMs, and AMP combinations that are not evaluated in the GALL Report.

3.4.2.3.9 Steam Seal System, Nonsafety-Related Components Affecting Safety-Related Systems Summary of Aging Management Evaluation – LRA Table 3.3.2-14-44

The staff reviewed LRA Table 3.3.2-14-44, which summarizes the results of AMR evaluations for the Steam Seal System nonsafety-related component groups affecting safety-related systems. LRA Table 3.3.2-14-44 states that the AMR results for the Steam Seal System are consistent with the GALL Report with the exception of one line item. The one line item consists

of stainless steel material and component type - tubing exposed to steam (internal). The applicant identified TLAA - metal fatigue as the aging effect requiring management.

SER Section 4.3 documents the staff's review of the applicant's evaluation of this TLAA. For other line items the staff confirmed that the AMR results presented in this table are consistent with the GALL Report. The staff's evaluation for AMR line items that are consistent with the GALL Report is documented in SER Section 3.4.2.1.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.4.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the S&PC system components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5 Aging Management of Structures and Component Supports

This section of the SER documents the staff's review of the applicant's AMR results for the structures and component supports components and component groups of the following:

- reactor building and primary containment
- water control structures
- turbine building complex and yard structures
- bulk commodities

3.5.1 Summary of Technical Information in the Application

In LRA Section 3.5, the applicant provided AMR results for the structures and component supports components and component groups. In LRA Table 3.5.1, "Summary of Aging Management Programs for the Structures and Component Supports," the applicant provided a summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the structures and component supports components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.5.2 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 structures and component supports components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 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 that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.5.2.2. The staff's audit evaluations are documented in SER Section 3.5.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and whether the aging effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are documented in SER Section 3.5.2.3. The staff's evaluation of the technical review is also documented in SER Section 3.5.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the structures and component supports components.

Table 3.5-1, provided below, includes a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.5, that are addressed in the GALL Report.

Table 3.5-1 Staff Evaluation for Structures and Component Supports in the GALL Report

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
BWR Concrete and Steel (Mark I, II, and III) Containments				
Concrete elements: walls, dome, basemat, ring girder, buttresses, containment (as applicable). (3.5.1-1)	Aging of accessible and inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	ISI (IWL) and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater if environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	N/A	Not applicable (See SER Section 3.5.2.2.1)
Concrete elements; All (3.5.1-2)	Cracks and distortion due to increased stress levels from settlement	Structures Monitoring Program. If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	N/A	Not applicable (See SER Section 3.5.2.2.1)
Concrete elements: foundation, sub-foundation (3.5.1-3)	Reduction in foundation strength, cracking, differential settlement due to erosion of porous concrete subfoundation	Structures Monitoring Program If a de-watering system is relied upon to control erosion of cement from porous concrete subfoundations, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	N/A	Not applicable (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
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	N/A	Not applicable (See SER Section 3.5.2.2.1)
Steel elements: Drywell; torus; drywell head; embedded shell and sand pocket regions; drywell support skirt; torus ring girder; downcomers; liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, suppression chamber (as applicable) (3.5.1-5)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
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	N/A	Not applicable (See SER Section 3.5.2.2.1)
Prestressed containment tendons (3.5.1-7)	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA, evaluated in accordance with 10 CFR 54.21(c)	N/A	Not applicable (See SER Section 3.5.2.2.1)
Steel and stainless steel elements: vent line, vent header, vent line bellows; downcomers; (3.5.1-8)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA - Metal fatigue	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Steel, stainless steel elements, dissimilar metal welds: penetration sleeves, penetration bellows; suppression pool shell, unbraced downcomers (3.5.1-9)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	TLAA - Metal fatigue	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
Stainless steel penetration sleeves, penetration bellows, dissimilar metal welds (3.5.1-10)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examinations/ evaluations for bellows assemblies and dissimilar metal welds.	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
Stainless steel vent line bellows, (3.5.1-11)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J, and additional appropriate examination/ evaluation for bellows assemblies and dissimilar metal welds.	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
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	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
Steel, stainless steel elements, dissimilar metal welds: torus; vent line; vent header; vent line bellows; downcomers (3.5.1-13)	Cracking due to cyclic loading	ISI (IWE) and 10 CFR Part 50, Appendix J, and supplemented to detect fine cracks	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Concrete elements: dome, wall, basemat ring girder, buttresses, containment (as applicable) (3.5.1-14)	Loss of material (Scaling, cracking, and spalling) due to freeze-thaw	ISI (IWL). Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	None	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
Concrete elements: walls, dome, basemat, ring girder, buttresses, containment, concrete fill-in annulus (as applicable). (3.5.1-15)	Cracking due to expansion and reaction with aggregate; increase in porosity, permeability due to leaching of calcium hydroxide	ISI (IWL) for accessible areas. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R.	None	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.1)
Seals, gaskets, and moisture barriers (3.5.1-16)	Loss of sealing and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	ISI (IWE) and 10 CFR Part 50, Appendix J	Structures Monitoring Program, Containment Inservice Inspection, and Containment Leak Rate program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1.1)
Personnel airlock, equipment hatch and CRD hatch locks, hinges, and closure mechanisms (3.5.1-17)	Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms	10 CFR Part 50, Appendix J and Plant Technical Specifications	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
Steel penetration sleeves and dissimilar metal welds; personnel airlock, equipment hatch and CRD hatch (3.5.1-18)	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Containment Inservice Inspection (CII) and Containment Leak Rate program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1.2)
Steel elements: stainless steel suppression chamber shell (inner surface) (3.5.1-19)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	N/A	Not applicable (See SER Section 3.5.2.1.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	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	N/A	Not applicable (See SER Section 3.5.2.1.9)
Steel elements: drywell head and downcomer pipes (3.5.1-21)	Fretting or lock up due to mechanical wear	ISI (IWE)	Containment Inservice Inspection (CII)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
Prestressed containment: tendons and anchorage components (3.5.1-22)	Loss of material due to corrosion	ISI (IWL)	N/A	Not applicable (See SER Section 3.5.2.1.9)
Safety-Related and Other Structures; and Component Supports				
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-23)	Cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
All Groups except Group 6: interior and above grade exterior concrete (3.5.1-24)	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
All Groups except Group 6: steel components: all structural steel (3.5.1-25)	Loss of material due to corrosion	Structures Monitoring Program. If protective coatings are relied upon to manage the effects of aging, the structures monitoring program is to include provisions to address protective coating monitoring and maintenance.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
All Groups except Group 6: accessible and inaccessible concrete: foundation (3.5.1-26)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
All Groups except Group 6: accessible and inaccessible interior/exterior concrete (3.5.1-27)	Cracking due to expansion due to reaction with aggregates	Structures Monitoring Program. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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 licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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 licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 4: Radial beam seats in BWR drywell; RPV support shoes for PWR with nozzle supports; Steam generator supports (3.5.1-30)	Lock-up due to wear	ISI (IWF) or Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 6: Concrete; all (3.5.1-34)	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack; cracking, loss of bond, loss of material due to corrosion of embedded steel	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs and for inaccessible concrete, an examination of representative samples of below-grade concrete, and periodic monitoring of groundwater, if the environment is non-aggressive. A plant-specific program is to be evaluated if environment is aggressive.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
Group 6: exterior above and below grade concrete foundation (3.5.1-35)	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. Evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index > 100 day-inch/yr) (NUREG-1557).	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 6: all accessible/ inaccessible reinforced concrete (3.5.1-36)	Cracking due to expansion/reaction with aggregates	Accessible areas: Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance programs. None for inaccessible areas if concrete was constructed in accordance with the recommendations in ACI 201.2R-77.	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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.	None	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
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	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-39)	Loss of material due to general and pitting corrosion	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates (3.5.1-40)	Reduction in concrete anchor capacity due to local concrete degradation/ service-induced cracking or other concrete aging mechanisms	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
Vibration isolation elements (3.5.1-41)	Reduction or loss of isolation function/radiation hardening, temperature, humidity, sustained vibratory loading	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.5.2.2.2)
Groups B1.1, B1.2, and B1.3: support members: anchor bolts, welds (3.5.1-42)	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA, evaluated in accordance with 10 CFR 54.21(c)	None	Not applicable (See SER Section 3.5.2.2.2) (No CLB fatigue analysis exists)
Groups 1-3, 5, 6: all masonry block walls (3.5.1-43)	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	Masonry Wall & Fire Protection Programs	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
Group 6 elastomer seals, gaskets, and moisture barriers (3.5.1-44)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
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	Structures Monitoring Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1.5)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group 5: Fuel pool liners (3.5.1-46)	Cracking due to stress corrosion cracking; loss of material due to pitting and crevice corrosion	Water Chemistry and monitoring of spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	Water Chemistry Control Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
Group 6: all metal structural members (3.5.1-47)	Loss of material due to general (steel only), pitting and crevice corrosion	Inspection of Water-Control Structures or FERC/US Army Corps of Engineers dam inspections and maintenance. If protective coatings are relied upon to manage aging, protective coating monitoring and maintenance provisions should be included.	None	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
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	None	Not applicable (See SER Section 3.5.2.1.9)
Support members; welds; bolted connections; support anchorage to building structure (3.5.1-49)	Loss of material/general, pitting, and crevice corrosion	Water Chemistry and ISI (IWF)	Water Chemistry and IWF Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1.7)
Groups B2, and B4: galvanized steel, aluminum, stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-50)	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	Structures Monitoring Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Group B1.1: high strength low-alloy bolts (3.5.1-51)	Cracking due to stress corrosion cracking; loss of material due to general corrosion	Bolting Integrity	None	Aging effect not applicable (See SER Section 3.5.2.1.10)
Groups B2, and B4: sliding support bearings and sliding support surfaces (3.5.1-52)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	Structures Monitoring Program	None	Aging effect not applicable (See SER Section 3.5.2.1.10)
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)	IWF Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1.8)
Groups B1.1, B1.2, and B1.3: Constant and variable load spring hangers; guides; stops; (3.5.1-54)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	None	Aging effect not applicable (See SER Section 3.5.2.1.10)
Steel, galvanized steel, and aluminum support members; welds; bolted connections; support anchorage to building structure (3.5.1-55)	Loss of material due to boric acid corrosion	Boric Acid Corrosion	None	Not applicable to BWRs
Groups B1.1, B1.2, and B1.3: Sliding surfaces (3.5.1-56)	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	Structures Monitoring Program	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.5.2.1)
Groups B1.1, B1.2, and B1.3: Vibration isolation elements (3.5.1-57)	Reduction or loss of isolation function/ radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	None	Not applicable (See SER Section 3.5.2.1.9)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Galvanized steel and aluminum support members; welds; bolted connections; support anchorage to building structure exposed to air - indoor uncontrolled (3.5.1-58)	None	None	None	Consistent with GALL Report
Stainless steel support members; welds; bolted connections; support anchorage to building structure (3.5.1-59)	None	None	None	Consistent with GALL Report

The staff's review of the structures and component supports component groups followed one of several approaches. One approach, documented in SER Section 3.5.2.1, discusses the staff's review of the AMR results for components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in SER Section 3.5.2.2, discusses the staff's review of the 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, discusses the staff's review of the 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 that are credited to manage or monitor aging effects of the structures and component supports components is documented in SER Section 3.0.3.

3.5.2.1 AMR Results That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.5.2.1, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the effects of aging related to the structures and component supports components:

- Containment Leak Rate Program
- Fire Protection Program
- Fire Water System Program
- Containment Inservice Inspection Program
- Inservice Inspection Program
- Masonry Wall Program
- Structures Monitoring Program
- Water Chemistry Control - BWR Program

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant provided a summary of AMRs for the structures and component supports components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes describe how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E, which indicate that 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report and the 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant is consistent with the AMP identified in the GALL Report 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 AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report that has the same material, environment, aging effect, and AMP as the component that was 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 AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP identified in the GALL Report 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 a different AMP is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit and review of the information provided in the LRA and the bases documents. 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.

For aging management evaluations that the applicant stated are consistent with the GALL Report and for which further evaluation is not recommended, the staff conducted its audit and review to determine if the applicant's reference to the GALL Report in the LRA is acceptable.

The staff evaluated AMR line items to determine that the applicant (1) provides a brief description of the system, components, materials, and environment; (2) states that the applicable aging effects have been reviewed and are evaluated in the GALL Report; and (3) identifies those aging effects for the reactor building, primary containment, water control structures, turbine building complex and yard structures, and bulk commodities components that are subject to an AMR. The staff also determined that the LRA line item is consistent with the GALL Report Volume 2 system tables line item for component type and material, environment, aging effects, and AMP.

3.5.2.1.1 Loss of Sealing and Leakage through Containment Due to Deterioration of Joint Seals, Gaskets, and Moisture Barriers (Caulking, Flashing, and Other Sealants)

For loss of sealing and leakage through containment due to deterioration of elastomer, rubber, and other similar material joint seals, gaskets, and moisture barriers (caulking, flashing, and other sealants) exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Section XI, Subsection IWE," and GALL AMP XI.S4, "10 CFR Part 50, Appendix J." The applicant manages cracking and change in material properties by the Containment Leak Rate Program and Structures Monitoring Program. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff noted that in the discussion column of LRA Table 3.5.1, Item 3.5.1-16, the applicant stated that seals and gaskets are not included in the Containment Inservice Inspection Program. One of the components for this item number is the floor moisture barriers.

During the audit and review, the staff asked whether the applicant uses the Containment Inservice Inspection Program to manage the aging effect of the floor moisture barriers.

In its response, the applicant stated that the Structures Monitoring Program will manage the aging effect of the drywell floor moisture barrier, and the Containment Leak Rate (10 CFR Part 50, Appendix J) Program will manage the aging effect of the primary containment

electrical penetration seals and sealants. The staff noted that the drywell floor moisture barrier is a containment internal seal, and therefore, 10 CFR Part 50, Appendix J does not apply and the applicant's Structures Monitoring Program describe how it manages change in material properties due to deterioration of the elastomer drywell floor liner seal (moisture barrier) exposed to a protected-from-weather environment. Therefore, the staff finds it acceptable.

The staff reviewed the Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.18. The Structures Monitoring Program encompasses the ASME Code Section XI, Subsection IWE requirements for managing the deterioration (cracking and change in material properties) of the primary containment moisture barrier through visual inspections. The staff found it to be an acceptable management program for detecting cracking and change in material properties.

But, cracking and change in material properties due to deterioration of the elastomer primary containment electrical penetration seals and sealant exposed to a protected-from-weather environment are managed using the Containment Leak Rate Program by the applicant.

The staff reviewed the Containment Leak Rate Program and its evaluation is documented in SER Section 3.0.3.1.1. The applicant uses the Containment Leak Rate Program only to detect deterioration of the containment electrical penetration seals and sealant. Although the GALL Report also specifies GALL AMP XI.S1, “ASME Section XI, Subsection IWE,” for this line item, the 1998 Edition and later editions of the ASME Code Section XI, Subsection IWE, do not require the inspection of seals and gaskets. Since the applicant has not assigned two AMPs to manage this aging effect, the applicant has conservatively called the application of only the Containment Leak Rate Program a different program with respect to the GALL Report.

Because the applicant’s Containment Leak Rate Program is consistent with the GALL Report and the 1998 Edition and later editions of the ASME Code Section XI, Subsection IWE, do not require the inspection of seals and gaskets, the staff finds the Containment Leak Rate Program alone to be an acceptable management program for detecting cracking and change in material properties of containment electrical penetration seals and sealants.

On the basis of its review, the staff finds that the applicant appropriately addressed the AEM, as recommended by the GALL Report.

3.5.2.1.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

In LRA Table 3.5.1, Item 3.5.1-18, the applicant stated that for loss of material due to general, pitting and crevice corrosion of steel (and dissimilar metal welds) penetration sleeves, personnel airlock, equipment hatch and CRD hatch exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, “ASME Section XI, Subsection IWE,” and GALL AMP XI.S4, “10 CFR Part 50, Appendix J.” In the discussion column for this line item, the applicant stated that Containment Inservice Inspection (CII) and Containment Leak Rate Programs will manage this aging effect. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

However, loss of material of the carbon steel CRD removal hatch, equipment hatch, personnel airlock, primary containment electrical penetrations, torus electrical penetrations, and torus mechanical penetrations exposed to a protected-from-weather environment is managed using the Containment Inservice Inspection Program (plant-specific) and the Containment Leak Rate Program by the applicant.

The staff reviewed the Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The Containment Inservice Inspection Program encompasses the ASME Code Section XI, Subsection IWE requirements for managing the loss of material for the primary containment and its integral attachments.

Because the applicant’s plant-specific Containment Inservice Inspection Program 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 an acceptable management program for loss of material of the above components.

The staff also reviewed the Containment Leak Rate Program and its evaluation is documented in SER Section 3.0.3.1.1. The applicant's Containment Leak Rate Program is consistent with GALL AMP XI.S4. The staff finds the Containment Leak Rate Program to be an acceptable AMP to detect loss of material of the carbon steel CRD removal hatch, equipment hatch, personnel air lock, primary containment electrical penetrations, torus electrical and mechanical penetrations.

On the basis of its review, the staff finds that the applicant appropriately addressed the AEM, as recommended by the GALL Report.

3.5.2.1.3 Loss of Material Due to General and Pitting Corrosion

In LRA Table 3.5.1, Item 3.5.1-39, the applicant stated that for loss of material due to general, pitting, and corrosion of steel support members, welds, bolted connections, and support anchorage to building structures exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S6, “Structures Monitoring Program.” In the discussion column for this line item, the applicant stated that loss of material of carbon steel fire hose reels and damper framing exposed to a protected-from-weather environment is managed using the Fire Protection Program or Fire Water System Program. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited. The staff's further evaluation of Group 1-5, 7, and 8 Structures is discussed in SER Section 3.5.2.2.2 for this line item.

The staff reviewed the Fire Water System Program and its evaluation is documented in SER Section 3.0.3.2.12. The Fire Water System Program applies to water-based fire protection systems which consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations (including fire hose reels), standpipe, and aboveground and underground piping and components. Components are tested in accordance with applicable NFPA codes and standards. Such testing assures that carbon steel fire hose reels and damper housing will be inspected for corrosion.

Because the applicant's Fire Water System Program includes hose stations (including fire hose reels) which are tested in accordance with NFPA codes and standards to detect corrosion, the staff found it to be an acceptable management program for loss of material of fire hose reels in lieu of the Structures Monitoring Program.

The staff reviewed the Fire Protection Program and its evaluation is documented in SER Section 3.0.3.2.11. The program is enhanced to require visual inspection of components when the diesel driven fire pump is running to verify no degradation is occurring.

On the basis of its review, the staff finds the applicant appropriately addressed loss of material due to general, pitting, and corrosion of steel support members, welds, bolted connections, and support anchorage to building structures exposed to indoor uncontrolled air or outdoor air.

3.5.2.1.4 Loss of Sealing Due to Deterioration of Seals, Gaskets, and Moisture Barriers (Caulking, Flashing, and Other Sealants)

The staff noted that in LRA Table 3.5.2-4, the applicant stated that for component seals and gaskets (doors, manway, and hatches), material rubber is protected from weather environment; the aging effects are cracking and change in material properties. The AERM is identified as "Structures Monitoring Program." The GALL Report line item referenced is III.A6-12, and the Table 1 reference is 3.5.1-44. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited. However, the staff noted that GALL Report Item III.A6-12 and Table 1 Item 3.5.1-44 both specify the Structures Monitoring Program.

During the audit and review, the staff asked the applicant to explain why the line items were assigned Note E instead of Note A for the lower half of this AMR line items.

The applicant stated that the LRA Table 3.5.2-4 for line item 3.5.1-44 will be clarified to indicate that Note A applies to this item. In its response dated February 1, 2007, the applicant revised LRA Table 3-5.2-4 to state "structure and/or component or commodity of seals and gaskets, Note "A" replaces Note "E."

The staff reviewed the Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.18. The staff determined that the applicant's program is consistent with GALL Report with enhancements. The program will be enhanced to provide guidance for performing structural examinations of elastomers (seal, gasket, seismic joint filler, and roof elastomers) to identify cracking and change in material properties.

On the basis of its review of the applicant's response, the staff finds the response acceptable and that the applicant appropriately addressed the AEM, as recommended by the GALL Report.

3.5.2.1.5Loss of Material Due to Abrasion, Cavitation

In LRA Table 3.5.1, Item 3.5.1-45, the applicant stated that for loss of material due to abrasion and cavitation of reinforced concrete exterior above and below grade foundation and interior slab exposed to flowing water, the GALL Report recommends programs consistent with GALL

AMP XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.”

However, in the discussion column for this line item, the applicant stated that loss of material of reinforced concrete exterior walls below grade (SW area), exterior walls below grade (CWS area), foundation, interior walls below grade, exterior walls above grade, exterior walls below grade, and foundation exposed to a fluid environment, is managed using the Structures Monitoring Program. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff reviewed the Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.18. The staff determined that the attributes of GALL AMP XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants,” applicable to the water control structures have been incorporated into the applicant's Structures Monitoring Program. On this basis, the staff found the Structures Monitoring Program to be an acceptable AMP for loss of material of the components listed above.

On the basis of its review, the staff finds the applicant appropriately addressed the AERM, as recommended by the GALL Report.

3.5.2.1.6 Loss of Material Due to General (Steel Only), Pitting, and Crevice Corrosion

In LRA Table 3.5.1, Item 3.5.1-47, the applicant stated that:

> For loss of material due to general, pitting, and crevice corrosion of group six metal structural members exposed to indoor uncontrolled air, outdoor air, flowing water, or standing water, the GALL Report recommends programs consistent with GALL AMP XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.”

However, in the discussion column for this line item, the applicant stated that loss of material of metal structural steel beams, columns, plates exposed to a protected-from-weather-or-fluid environment; metal anchorage/embedment exposed to a fluid environment; metal manway hatches and hatch covers exposed to a protected-from-weather or weather environment; and structural bolting exposed to a fluid environment, is managed using the Structures Monitoring Program. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR line items are consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff reviewed the Structures Monitoring Program and its evaluation is documented in SER Section 3.0.3.2.18. GALL AMP XI.S7 states that for plants not committed to RG 1.127, Revision 1, aging management of water control structures may be included in the Structures Monitoring Program. The attributes of GALL AMP XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants,” applicable to the water control structures have been incorporated into the applicant's Structures Monitoring Program.

Because the applicant's Structures Monitoring Program includes the attributes of GALL AMP XI.S7, "Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants," applicable to the water control structures as recommended by the GALL Report, the staff found it to be an acceptable management program for loss of material of the components listed above.

On the basis of its review, the staff found the applicant appropriately addressed the AEM, as recommended by the GALL Report.

3.5.2.1.7 Loss of Material Due to General, Pitting, and Crevice Corrosion

In LRA Table 3.5.1, Item 3.5.1-49, the applicant stated:

> For loss of material due to general, pitting, and crevice corrosion of stainless steel and steel support members; bolted connections; support anchorage to building structure exposed to treated water (<140°F) the GALL Report recommends programs consistent with GALL AMP XI.M2, "Water Chemistry," for BWR water, and GALL AMP XI.S3, "ASME Section XI, Subsection IWF."

However, in the discussion column for this line item, the applicant stated that loss of material of carbon steel and stainless steel (SS) anchorage/embedments exposed to a fluid environment is managed using the Water Chemistry Control – BWR Program and the Inservice Inspection Program. The LRA Table 2 AMR line items that reference this Table 1 line item cite Generic Note E, indicating that the AMR is consistent with GALL Report material, environment, and aging effect, but a different AMP is credited.

The staff reviewed the Water Chemistry Control - BWR Program and its evaluation is documented in SER Section 3.0.3.1.10. The JAFNPP Water Chemistry Control - BWR Program is based on BWRVIP-130 guidelines and it provides an acceptable method of controlling water chemistry that is consistent with the GALL Report recommendations for managing the loss of material for ASME Class 1, 2, and 3 steel piping supports and steel component supports within containment.

Because the applicant's Water Chemistry Control - BWR Program includes the attributes of GALL AMP XI.M2, "Water Chemistry," applicable to the Water Chemistry Control - BWR as recommended by the GALL Report, the staff found it to be an acceptable program for managing the loss of material for ASME Class 1, 2, and 3 steel piping supports and steel component supports within containment.

The staff reviewed the Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.3. The JAFNPP Inservice Inspection Program encompasses the ASME Code Section XI, Subsection IWF requirements for managing the loss of material for ASME Class 1, 2, and 3 steel piping supports and steel component supports within containment.

Because the applicant's plant-specific Inservice Inspection Program includes the same requirements for inspection and detection of loss of material for ASME Class 1, 2, and 3 steel piping supports and steel component supports within containment as the ASME Code Section XI, Subsection IWF, the staff found it to be an acceptable management program for

loss of material of carbon steel and SS anchorage/embedment.

On the basis of its review, the staff found the applicant appropriately addressed the AEM, as recommended by the GALL Report.

3.5.2.1.8 Loss of Material Due to General and Pitting Corrosion

In the discussion column of LRA Table 3.5.1, Item 3.5.1-53, the applicant stated that loss of material due to general and pitting corrosion of steel support members; welds, bolted connections; and support anchorage to building structure exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S3, “ASME Section XI, Subsection IWF.”

However, loss of material of steel RV support assembly, RV stabilizer supports, torus external supports (columns, saddles), anchorage/embedment, base plates, component and piping supports ASME Class 1, 2, 3 and MC, anchor bolts, and ASME Class 1, 2, 3 and MC supports bolting exposed to a protected-from-weather environment and anchorage/embedment, base plates, component and piping supports ASME Class 1, 2, 3 and MC, anchor bolts, and ASME Class 1, 2, 3 and MC supports bolting exposed to a weather environment is managed using the Inservice Inspection Program by the applicant.

The staff reviewed the Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.3. The JAFNPP Inservice Inspection Program encompasses the ASME Code Section XI, Subsection IWF requirements for managing the loss of material for ASME Class 1, 2, and 3 steel piping supports and steel component supports within containment.

Because the applicant’s plant-specific Inservice Inspection Program includes the same requirements for inspection and detection of loss of material for ASME Class 1, 2, and 3 steel piping supports and steel component supports within containment as the ASME Code Section XI, Subsection IWF, the staff found it to be an acceptable program for loss of material of the components listed above.

On the basis of its review, the staff found that the applicant adequately addressed the AEM, as recommended by the GALL Report.

3.5.2.1.9 AMR Results Identified as Not Applicable

In LRA Table 3.5.1, line items 19, 20, 22, 48, and 57 are identified as “Not Applicable” since the component/material/ environment combination does not exist at JAFNPP. For each of these line items, the staff reviewed the LRA and the applicant’s supporting documents, and confirmed the applicant’s claim that the component/material/environment combination does not exist at JAFNPP. On the basis that JAFNPP does not have the component/material/ environment combination for these Table 1 line items, the staff finds that these AMRs are not applicable to JAFNPP.

3.5.2.1.10 AMR Results with No Aging Effects Identified

In the LRA Table 3.5.1, item 3.5.1-51 discussion column, the applicant states that cracking and loss of material of Group B1.1 – high-strength, low-alloy bolts – due to stress corrosion and general corrosion is not applicable to JAFNPP. SCC of high-strength anchor bolts is not an AERM at JAFNPP for two reasons: (1) JAFNPP does not utilize high-strength bolting in structural applications; the bolting used is not exposed to a corrosive environment or high tensile stresses; and (2) bolting connections are installed with friction-type contact surfaces via the turn-of-the-nut method; therefore, for bolts greater than 1 inch in diameter, a significant preload (in the order of 70 percent of ultimate strength) is not practical to develop. The JAFNPP Inservice Inspection (IWF) Program manages loss for bolting connections.

The staff finds acceptable the applicant's assessment that cracking of high-strength low-alloy bolts due to stress corrosion will not occur for Group B1.1 components since a corrosive environment and high tensile stresses do not exist.

On the basis that the environment and high tensile stresses needed to cause cracking from SCC do not exist for high-strength low-alloy bolts in the SC supports at JAFNPP, the staff finds that, for this component type, this aging effect is not applicable to JAFNPP.

In the LRA Table 3.5.1, item 3.5.1-52 discussion column, the applicant states that the loss of mechanical function of Groups B2 and B4 – sliding support bearing and sliding support surfaces due to corrosion, distortion, dirt, overload, and fatigue due to vibratory and cyclic thermal loads – is not applicable to JAFNPP as discussed below.

In the discussion section of LRA Table 3.5.1, item 3.5.1-52, the applicant states that loss of mechanical function due to the listed mechanisms is not an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to cyclic thermal loads are rare for structural supports due to their relatively low temperatures.

The applicant stated that the sliding surface material used at JAFNPP is Lubrite®, which is a corrosion-resistant material. Components are inspected under the Inservice Inspection (IWF) Program for torus saddle supports and Structures Monitoring Program for the Lubrite® components of radial beam seats. Plant operating experience has not identified failure of Lubrite® components used in structural applications. No current industry experience has identified failure associated with Lubrite® sliding surfaces. Components associated with B2 grouping are limited to the torus radial beam seats and support saddles. There are no sliding support surfaces associated with the B4 component grouping for sliding surfaces at JAFNPP.

The staff finds acceptable the applicant's assessment that loss of mechanical function due to distortion, dirt, overload, and fatigue due to vibratory and cyclic thermal loads are not AERMs. Such failures do typically result from inadequate design or events rather than the effects of aging.

On the basis that the mechanisms provided in LRA Table 3.5.1, item 3.5.1-52, other than corrosion, are not aging mechanisms which cause aging effects for Groups B2 and B4 components in the SC supports at JAFNPP, the staff finds that, for this component type, this

aging effect is not applicable to JAFNPP.

In the LRA Table 3.5.1, item 3.5.1-54 discussion column, the applicant states that the loss of mechanical function of Groups B1.1, B1.2, and B1.3 – constant and variable load spring hangers; guides and stops due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads – is not applicable to JAFNPP as discussed below.

In the discussion section of LRA Table 3.5.1, item 3.5.1-54, the applicant states that loss of mechanical function due to the listed mechanisms is not an aging effect. Loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads are not AERMs. Such failures typically result from inadequate design or events rather than the effects of aging. Loss of material due to corrosion, which could cause loss of mechanical function, is addressed under Item 3.5.1-53 for Groups B1.1, B1.2, and B1.3 support members.

The staff finds acceptable the applicant's assessment that loss of mechanical function due to corrosion, distortion, dirt, overload, and fatigue due to vibratory and cyclic thermal loads are not AERMs. Such failures do typically result from inadequate design or events rather than the effects of aging.

On the basis that the mechanisms provided in LRA Table 3.5.1, item 3.5.1-54, other than corrosion, are not aging mechanisms which cause aging effects for Groups B1.1, B1.2, and B1.3 components in the SC supports at JAFNPP, the staff finds that, for this component type, this aging effect is not applicable to JAFNPP.

Conclusion. The staff evaluated the applicant’s claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant’s consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.5.2.2, the applicant provided further evaluation of aging management, as recommended by the GALL Report, for the structures and component supports components. The applicant provided information concerning how it will manage aging effects in the following three areas:

(1) PWR and BWR containments:

- aging of inaccessible concrete areas
- cracks and distortion due to increased stress levels from settlement; reduction of foundation strength, cracking and differential settlement due to erosion of porous concrete subfoundations, if not covered by structures monitoring program

- reduction of strength and modulus of concrete structures due to elevated temperature
- loss of material due to general, pitting and crevice corrosion
- loss of prestress due to relaxation, shrinkage, creep, and elevated temperature
- cumulative fatigue damage
- cracking due to stress corrosion cracking
- cracking due to cyclic loading
- loss of material (scaling, cracking, and spalling) due to freeze-thaw
- cracking due to expansion and reaction with aggregate, and increase in porosity and permeability due to leaching of calcium hydroxide

(2) safety-related and other structures and component supports:

- aging of structures not covered by structures monitoring program
- aging management of inaccessible areas
- reduction of strength and modulus of concrete structures due to elevated temperature
- aging management of inaccessible areas for Group 6 structures
- cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion
- aging of supports not covered by structures monitoring program
- cumulative fatigue damage due to cyclic loading

(3) QA for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL 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 3.5.2.2. The staff's evaluation of the aging effects is discussed in the following sections.

3.5.2.2.1 PWR and BWR Containments

The staff reviewed LRA Section 3.5.2.2.1 against the criteria in SRP-LR Section 3.5.2.2.1, which addresses several areas that are discussed below.

Aging of Inaccessible Concrete Areas. The staff reviewed LRA Section 3.5.2.2.1.1 against the criteria in SRP-LR Section 3.5.2.2.1.1.

In LRA Section 3.5.2.2.1.1, the applicant states that JAFNPP has a Mark I free-standing steel containment located within the reactor building. Inaccessible and accessible concrete areas are

designed in accordance with ACI specification ACI 318-63, "Building Code Requirements for Reinforced Concrete," which results in low permeability and resistance to aggressive chemical solutions by requiring the following:

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

JAFNPP concrete also meets requirements of later ACI guide ACI 201.2R-77, "Guide to Durable Concrete," since both documents use the same ASTM standards for selection, application, and testing of concrete.

The below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1500 ppm). Concrete was provided with at least the minimum required air content between 3 and 6percent and a low water/cement ratio (0.50 or less). Although specified water/cement ratios fall outside the established range of 0.35 to 0.45, given all remaining parameters for durable concrete mix design, JAFNPP concrete meets the quality requirements of ACI to ensure acceptable concrete is obtained. Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable to concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Structures Monitoring Program.

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 could occur in inaccessible areas of PWR and BWR concrete and steel containments. The existing program relies on ASME Section XI, Subsection IWL to manage these aging effects. However, the GALL Report recommends further evaluation of plant-specific programs to manage the aging effects for inaccessible areas if the environment is aggressive.

The staff found these aging effects not applicable to the Mark I freestanding steel containment. The listed possible aging effects apply to concrete elements of PWR containments and concrete BWR containments. The Mark I steel containment is located within the concrete reactor building, and the applicant statement is for that concrete structure.

On the basis that there are no components from this group, the staff concludes that this aging effect is not applicable to JAFNPP.

<u>Cracks and Distortion Due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, Cracking and Differential Settlement Due to Erosion of Porous Concrete Subfoundations, If Not Covered by Structures Monitoring Program</u>. The staff reviewed LRA Section 3.5.2.2.1.2 against the criteria in SRP-LR Section 3.5.2.2.1.2.

The LRA Section 3.5.2.2.1.2 states that for the 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), JAFNPP does not rely on a dewatering system for control of settlement. Structures

are founded on sandstone bedrock. JAFNPP containment was not identified in information notice (IN) 97-11 as a plant susceptible to erosion of porous concrete subfoundations. JAFNPP groundwater is not aggressive and there is no indication that ground water chemistry has significantly changed and no changes in groundwater conditions have been observed.

As a result, cracking and distortion due to increased stress level from settlement and reduction of foundation strength cracking and differential settlement due to erosion of porous concrete subfoundation are not AERMs for JAFNPP concrete structures.

SRP-LR Section 3.5.2.2.1.2 states that cracks and distortion due to increased stress levels from settlement could occur in PWR and BWR concrete and steel containments. Also, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in all types of PWR and BWR containments. The existing program relies on structures monitoring program to manage these aging effects. Some plants may rely on a de-watering system to lower the site ground water level. If the plant’s CLB credits a de-watering system, the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation. The GALL Report recommends no further evaluation if this activity is within the scope of the applicant’s structures monitoring program.

The staff determined through discussions with the applicant’s technical staff that the 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 due to the nonexistence of these aging mechanisms. The applicant states that the aging effects due to settlement are not expected at JAFNPP for the Mark I steel containment since it is located within the reactor building and supported by the reactor building foundation. The reactor building is founded on sound bedrock which prevents significant settlement. In addition, there is no porous concrete subfoundation below the reactor building of concern. The staff finds acceptable the applicant's assessment that these aging effects are not applicable to the JAFNPP containment due to the nonexistence of aging mechanisms.

The staff determined that these aging effects are not applicable to the JAFNPP containment.

On the basis that JAFNPP has no components from this group, the staff concludes that this aging effect is not applicable.

<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 states that the aging effect of reduction of strength and modulus of concrete structures due to elevated temperature is not applicable to JAFNPP. GALL Report Volume 2 items referencing this issue are associated with concrete containments. JAFNPP is a mark I steel containment.

SRP-LR Section 3.5.2.2.1.3 states that reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR concrete and steel containments. The implementation of 10 CFR 50.55a and ASME Section XI, Subsection IWL would not be able to

identify the reduction of strength and modulus of concrete due to elevated temperature. Subsection CC-3400 of ASME Section III, Division 2, specifies the concrete temperature limits for normal operation or any other long-term period. The GALL Report recommends further evaluation of a plant-specific AMP 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 staff determined through discussions with the applicant's technical staff and review of design bases documents that the reduction of strength and modulus for concrete structures due to elevated temperature are not plausible aging effects due to the nonexistence of these aging mechanisms. The applicant states that the aging effects due to elevated temperature are not expected at JAFNPP for the concrete associated with the Mark I steel containment, since general areas temperatures within the primary containment do not exceed 150 °F and local area temperatures do not exceed 200°F. The staff finds acceptable the applicant's assessment that these aging effects are not applicable to the JAFNPP containment since general areas temperatures within the primary containment do not exceed 150 °F and local area temperatures do not exceed 200 °F.

On the basis that there are no components from this group, the staff concludes that this aging effect is not applicable.

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 states that JAFNPP containment is a Mark I steel containment located within the reactor building. JAFNPP reactor building concrete in contact with the drywell shell is designed in accordance with specification ACI 318-63, "Building Code Requirements for Reinforced Concrete." The concrete meets requirements of later ACI guide ACI 201.2R-77 since both documents use the same ASTM standards for selection, application, and testing of concrete. Concrete is monitored for cracks under the Structures Monitoring Program. The drywell steel shell and the moisture barrier where the drywell shell becomes embedded in the drywell concrete floor are inspected in accordance with the Containment Inservice Inspection (IWE) Program and Structures Monitoring Program.

The LRA states that, to prevent corrosion of the lower part of the drywell shell, the interior and exterior surfaces are protected from contact with the atmosphere by complete concrete encasement. It is not credible for ground water to reach the drywell shell, assuming a crack in the concrete, since the concrete at this location is greater than 8 feet thick and poured in multiple horizontal planes. The sand cushion area is drained to protect the exterior surface of the drywell shell at the sand cushion interface from water that might enter the air gap. Therefore, significant corrosion of the drywell shell is not expected.

SRP-LR Section 3.5.2.2.1.4 states that loss of material due to general, pitting, and crevice corrosion could occur in steel elements of accessible and inaccessible areas for all types of PWR and BWR containments. The existing program relies on ASME Section XI, Subsection IWE, and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of plant-specific programs to manage this aging effect for inaccessible areas if corrosion is significant.

For loss of material due to general, pitting, and crevice corrosion of carbon steel for drywell, torus, drywell head, embedded shell and sand pocket regions, drywell support skirt, torus ring girder, downcomers, liner plate, ECCS suction header, support skirt, region shielded by diaphragm floor, and suppression chamber exposed to indoor uncontrolled air or treated water, the GALL Report recommends programs consistent with GALL AMP XI.S1, “ASME Section XI, Subsection IWE,” and GALL AMP XI.S4, “10 CFR Part 50, Appendix J.”

However, the applicant manages loss of material of the carbon steel (LRA Table 3.5.1, page 3.5-20, item 3.5.1-5) drywell head, drywell shell, drywell sump liner, drywell to torus vent system, torus manway, torus ring girder, torus shell, and torus thermowell exposed to a protected-from-weather environment using the Containment Inservice Inspection Program and the Containment Leak Rate Program.

The staff reviewed the Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The Containment Inservice Inspection Program encompasses the ASME Code Section XI, Subsection IWE requirements for managing the loss of material for the primary containment and its integral attachments. Also, the applicant manages loss of material of the carbon steel drywell sump liner, torus ring girder, and torus shell exposed to a fluid environment using the Containment Inservice Inspection Program and the Containment Leak Rate Program. Because the applicant’s plant-specific Containment Inservice Inspection Program 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 found it to be an acceptable AMP for loss of material of the above components.

During the audit and review, the staff asked the applicant to discuss how JAFNPP compares to the interim staff guidance document (ISG)-2006-01, “Plant Specific Aging Management Program for Inaccessible Areas of Boiling Water Reactor Mark I Steel Containment Drywell Shell,” proposal actions (4) and (5).

In its response, the applicant states that for JAFNPP, the sand cushion area at the base of the drywell is drained to protect the exterior surface of the drywell shell at the sand cushion interface from water that might enter the air gap. To ensure the drywell shell exterior remains dry during refueling evolutions, the drywell to reactor building bellows assembly separates the refueling cavity filled with water from the exterior surface of the drywell shell. Any leakage through the bellows assembly is directed to a drain system which is equipped with an alarm for notification of operators. Functional checks are performed on the alarm system and the air gap drains are monitored twice every refuel outage, once after flood-up and again prior to flood-down at the end of the outage. JAFNPP inspects the liner drains for the water reservoirs on the refuel floor (*e.g.,* spent fuel pool, dryer/separator pool, and the reactor cavity) for leakage. Leakage into the liner drains could be a precursor for water leaks which could wet the drywell shell exterior surface. These drains are examined for leakage after filling the refueling cavity.

For proposed action (5), the applicant states that to ensure the drywell shell exterior remains dry during refueling evolutions, the drywell to reactor building bellows assembly separates the refueling cavity filled with water from the exterior surface of the drywell shell. A backing plate surrounds the outer circumference of the bellows to protect it and provide a mechanism for

testing and monitoring of leakage. Any leakage through the bellows assembly is directed to a drain system which is equipped with an alarm for notification of operators.

To ensure the drywell shell exterior remains dry during refueling evolutions, the drywell to reactor building bellows assembly separates the refueling cavity filled with water from the exterior surface of the drywell shell. Any leakage through the bellows assembly is directed to a drain system ((inner bellows to the Drywell Equipment Drain Sump, outer bellows to the “B” Condensate Storage Tank), where two lines are each equipped with a flow indicator/switch that will alarm in the Control Room in the event of a bellows failure. A preventive maintenance (PM) - “Test of 19FIS-61 prior to initial refuel cavity flood-up” is performed every outage to verify the indicator/switch is functional and the Control Room annunciator responds when water is added to the line. In addition, a PM – “Functional Test of 19FIS-62" is performed every two years to verify the indicator/switch and associated Control Room annunciator are functional. If moisture/leakage is detected in the inaccessible area on the exterior of the drywell shell JAFNPP will: (a) identify the component source which may have introduced the moisture/leakage and include the component in an AMR program, (b) identify the surface areas requiring examination and implement augmented inspections for the period of extended operation in accordance with the ASME Section XI, Subsection IWE-1240 as identified in table IWE-2500-1, Examination category E-C, and (c) demonstrate through use of augmented inspections performed in accordance with ASME Code Section XI, Subsection IWE that corrosion is not occurring, or that corrosion is progressing so slowly that the age-related degradation will not jeopardize the intended function of the drywell shell through the period of extended operation.

In its response dated February 12, 2007 (LRA Amendment No. 6), the applicant stated that there has been no observed active leakage causing moisture in the vicinity of the sand cushion drain line at JAFNPP as monitored by IWE general visual examination of the exterior of the torus and torus room. No moisture has been detected or suspected on the inaccessible areas of the drywell shell. Any leakage through the refueling bellows assembly is directed to a drain system (inner bellows to the Drywell Equipment Drain Sump, outer bellows to the “B” Condensate Storage Tank). Therefore, no additional components have been identified that require an AMR as a source of moisture that may affect the drywell shell in the lower region.

In 1988, the applicant examined the air gap through the drain lines using fiber optic cables and did not have any evidence of moisture potentially causing corrosion of the drywell shell (Reference New York Power Authority (NYPA) Memorandum No. JTS-88-0875, from V. Walz to W. Fernandez, dated November 1, 1988). The applicant plans to perform an additional examination in 2007 (Reference maintenance work order WO # JAF-07-14863. If any evidence of moisture is identified JAF will determine additional inspection activities, as appropriate.

- JAF monitors refueling bellows leakage drain lines during every refueling outage. Flow indicator/switches 19FIS-61 and 19FIS-62 were successfully last tested in 2006. The flow indicators/switches are on a two year PM frequency.
- Drywell interior surfaces are examined for degradation every refueling outage in accordance with the JAF IWE Program. A general visual examination has been performed every refueling outage looking at the steel and concrete surfaces for shrinkage cracks in the concrete, cracking and peeling coating, and discoloration of the surface coating (bleed through, staining). There were areas of minor corrosion bleed

though the coating (less than 4 square feet) and staining (less than 50 square feet) caused by condensation from the “A” and “B” Cooling filter lines. The areas of peeling and flaking paint are less than 2 square feet areas. Engineering evaluated the minor surface condition at various locations and were found to be acceptable. The minor degraded areas are monitored every refueling outage.

- The drywell shell to floor caulked seal is inspected every refueling outage. A general visual examination is performed looking for cracking, peeling, delaminating or separation of the seal, discoloration in the caulking material, and flexibility of the caulking. The caulk seal has not been removed or replaced.
- Operating experience review at JAFNPP found no occurrences of leakage into the annulus air gap. In addition, no leakage has been found through the refueling bellows into the area monitored by the air gap leakage detection system.

The staff finds acceptable the applicant's programs described above and based on the applicant's observations of absence of water leakage into the drywell shell area, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.4. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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. In LRA Section 3.5.2.2.1.5, the applicant stated that JAFNPP is a Mark I containment and does not incorporate prestressed concrete in its design. Therefore, the staff finds that loss of prestress due to relaxation, shrinkage, creep, and elevated temperature do not apply.

Cumulative Fatigue Damage. In LRA Section 3.5.2.2.1.6, the applicant stated that if included in the CLB, 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, line bellows, and downcomers are TLAAs, as defined in 10 CFR 54.3.

SRP-LR Section 3.5.2.2.1.6 states that applicants must evaluate TLAAs in accordance with 10 CFR 54.21(c)(1).

SER Section 4.6 documents the staff’s review of the applicant’s evaluation of this TLAA.

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 states that the GALL Report recommends further evaluation of inspection methods to detect cracking due to SCC since visual VT-3 examinations may be unable to detect this aging effect. Potentially susceptible components at JAFNPP are penetration sleeves and bellows.

SCC is an aging mechanism that requires the simultaneous action of a corrosive environment, sustained tensile stress, and a susceptible material. Elimination of any one of these elements

will eliminate susceptibility to SCC. Stainless steel elements of primary containment and the containment vacuum breaker system, including dissimilar welds, are susceptible to SCC. However, these elements are located inside the containment drywell or outside the drywell, in the reactor building, and are not subject to corrosive environment as discussed below.

The drywell is made inert with nitrogen to render the primary containment atmosphere non-flammable by maintaining the oxygen content below 4% by volume during normal operation. The normal operating average temperature inside the drywell is less than 139°F and the relative humidity range is 20-40%. The reactor building normal operating temperature range is 65°F - 92°F, and the maximum relative humidity is 100%. Both the containment atmosphere and indoor air environments are non-corrosive (chlorides < 150 ppb, sulfates < 100 ppb, and fluorides 150 < ppb). Thus, SCC is not expected to occur in the containment penetration bellows, penetration sleeves, and dissimilar metal welds. A review of plant operating experience did not identify cracking of the components, and primary containment leakage has not been identified as a concern. Therefore the existing Containment Leakage Rate Program and Containment Inservice Inspection - IWE are adequate to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment Inservice Inspection -IWE and Containment Leak rate programs are described in Appendix B.

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 could occur in all types of PWR and BWR containments. Cracking due to SCC could also occur in stainless steel vent line bellows for BWR containments. The existing program relies on ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect. The GALL Report recommends further evaluation of additional appropriate examinations/evaluations implemented to detect these aging effects for stainless steel penetration sleeves, penetration bellows and dissimilar metal welds, and stainless steel vent line bellows.

During interviews with the staff, the applicant stated that the GALL Report's referenced programs involve visual inspection and leak rate testing, which are not optimum methods for managing SCC. Therefore, when possible, the "other" method which may be used to detect cracking is the existing Containment Leak Rate Program, and when necessary, augmented ultrasonic exams are utilized, which is the optimum method for managing SCC. As stated in LRA Section 3.5.2.2.1.7, SCC is not an AERM for the penetration sleeves and bellows, since the conditions necessary for SCC do not exist. However, the components are evaluated for aging effects (e.g., cracking requiring management as shown in LRA Table 3.5.2-1).

Based on the above discussion, the staff found that the applicant has identified IWE as capable of detecting leaks caused by SCC. Furthermore, additional materials will not meet the necessary combinations of material and environment required to produce SCC.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.7

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.7 for further evaluation. For those line items that apply to LRA Section 3.5.2.2.1.7, the staff determines that the LRA is consistent with the GALL Report

and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Cyclic Loading. The staff reviewed LRA Section 3.5.2.2.1.8 against the criteria in SRP-LR Section 3.5.2.2.1.8.

In LRA Section 3.5.2.2.1.8, the applicant stated that cyclic loading can lead to cracking of steel and stainless steel penetration bellows, and dissimilar metal welds of BWR containments and BWR suppression pool shell and downcomers.

With proper design, cracking due to cyclic loading is not expected to occur in the drywell, torus and associated penetration bellows, penetration sleeves, unbraced downcomers, and dissimilar metal welds. JAFNPP has experienced cracking of the torus shell near one column support due to hydrodynamic loads of the turbine exhaust pipe during HPCI operation, coupled with the highly restrained condition of the torus shell at the torus column support. The condition was not the effect of aging but rather the effect of inadequate design that led to cracking well before the end of the original license term. A review of plant operating experience did not identify any other cracking of the components, and primary containment leakage has not been identified as a concern. Nonetheless, the existing Containment Leakage Rate Program with augmented ultrasonic exams and Containment Inservice Inspection - IWE will continue to be used to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment Inservice Inspection -IWE and Containment Leak rate programs are described in Appendix B.

The analysis of cracking due to cyclic loading of the drywell, torus, and associated penetrations is a TLAA which is evaluated and documented in LRA Section 4.6.

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 for all types of PWR and BWR containments and BWR vent header, vent line bellows and downcomers. The existing program relies on ASME Section XI, Subsection IWE and 10 CFR Part 50, Appendix J, to manage this aging effect. However, VT-3 visual inspection may not detect fine cracks. The GALL Report recommends further evaluation for detection of this aging effect.

For cracking due to cyclic loading of steel, SS and dissimilar metal (DSM) welds for penetration sleeves, penetration bellows, suppression pool shell, and unbraced downcomers exposed to indoor uncontrolled air or outdoor air, the GALL Report recommends programs consistent with GALL AMP XI.S1, “ASME Section XI, Subsection IWE,” and GALL AMP XI.S4, “10 CFR Part 50, Appendix J.”

However, cracking due to cyclic loading of the carbon steel primary containment mechanical penetrations (including those with bellows) exposed to a protected-from-weather environment is managed by the applicant using the Containment Inservice Inspection Program and the Containment Leak Rate Program.

The staff reviewed the Containment Inservice Inspection Program and its evaluation is documented in SER Section 3.0.3.3.2. The Containment Inservice Inspection Program encompasses the ASME Code Section XI, Subsection IWE requirements for managing cracking of the primary containment and its integral attachments. Because the applicant's plant-specific Containment Inservice Inspection Program includes the same requirements for inspection and detection of cracking for the primary containment and its integral attachments as the ASME Code Section XI, Subsection IWE, the staff found it to be an acceptable management program for cracking of the primary containment mechanical penetrations (including those with bellows).

For cracking due to cyclic loading of steel, SS and DSM welds for torus, vent line, vent header, vent line bellows, and downcomers exposed to indoor uncontrolled air, the GALL Report recommends programs consistent with GALL AMP XI.S1, "ASME Section XI, Subsection IWE," and GALL AMP XI.S4, "10 CFR Part 50, Appendix J."

However, cracking due to cyclic loading of the stainless steel drywell to torus vent line bellows exposed to a protected-from-weather environment is managed by the applicant using the Containment Inservice Inspection Program and the Containment Leak Rate Program.

The staff's evaluation of the Containment Inservice Inspection Program is documented in SER Section 3.0.3.3.2. The staff's evaluation of the Containment Leak Rate Program is documented in SER Section 3.0.3.1.1. The Containment Leak Rate Program encompasses the requirements of 10 CFR Part 50, Appendix J. The Containment Inservice Inspection Program encompasses the ASME Code Section XI, Subsection IWE requirements for managing cracking of the primary containment and its integral attachments. Because the applicant's plant-specific Containment Inservice Inspection Program includes the same requirements for inspection and detection of cracking for the primary containment and its integral attachments as the ASME Code Section XI, Subsection IWE, the staff found it to be an acceptable management program for cracking of the drywell to torus vent line bellows.

During the audit and review, the staff asked the applicant to address the operating experience for the cracks identified in 2005 and to identify any additional inspections scheduled for the next inspection period.

In its response, the applicant stated that the cracks identified did not deviate significantly from the baseline inspection and were identified as "minor cracking." Follow-up actions were identified and as a result of the inspection no additional inspections were required.

Cracking due to cycle loading is not expected to occur in the drywell, torus, associated penetration bellows, penetration sleeves, unbraced downcomers, and DSM welds (LRA Table 3.5.1, Item 3.5.1-12). A review of plant operating experience did not identify cracking of the components, and primary containment leakage has not been identified as a concern. Nonetheless, the Containment Inservice Inspection (IWE), the existing Containment Leak Rate Program, and, when necessary, augmented ultrasonic exams will continue to be used to detect cracking. Observed conditions that have the potential for impacting an intended function are evaluated or corrected in accordance with the corrective action process. The Containment Inservice Inspection and Containment Leak Rate Programs are described in Appendix B.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.8 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.1.8. For those line items that apply to LRA Section 3.5.2.2.1.8, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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.

In LRA Section 3.5.2.2.1.9, the applicant stated that loss of material due to freeze-thaw of concrete containments is not applicable since JAFNPP has a Mark I steel containment.

The staff finds this evaluation acceptable in that this aging effect is not applicable to the applicant's Mark I steel containment.

Cracking Due to Expansion and Reaction with Aggregate, and Increase in Porosity and Permeability Due to Leaching of Calcium Hydroxide. The staff reviewed LRA Section 3.5.2.2.1.10 against the criteria in SRP-LR Section 3.5.2.2.1.10.

In LRA Section 3.5.2.2.1.10, the applicant stated that cracking due to expansion and reaction with aggregates of concrete containments is not applicable since JAFNPP has a Mark I steel containment.

The staff finds this evaluation acceptable in that this aging effect is not applicable to the applicant's Mark I steel containment.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

The staff reviewed LRA Section 3.5.2.2.2 against the criteria in SRP-LR Section 3.5.2.2.2, which addresses several areas that are discussed below.

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.

In LRA Section 3.5.2.2.2.1, the applicant stated that JAFNPP concrete structures subject to an AMR are included in the Structures Monitoring Program and supplemented by other AMPs as appropriate. This is true for concrete items even if the AMR did not identify AERMs. Aging effects discussed below for structural steel items are also addressed by the structures monitoring program. Additional discussion of specific aging effects follow.

SRP-LR Section 3.5.2.2.2.1 states that the GALL Report recommends further evaluation of certain structure/aging effect combinations if they are not covered by the structures monitoring program. This includes (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, 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, 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 that are not within the structures monitoring program. In addition, lock up due to wear could occur for Lubrite radial beam seats in BWR drywell, 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 the structures monitoring program or ASME Code Section XI, Subsection IWF, to manage this aging effect. The GALL Report recommends further evaluation only for structure/aging effect combinations that are not within the ISI (IWF) or structures monitoring program.

(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 - The applicant stated in the LRA that the aging mechanisms associated with cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are applicable only to below-grade concrete/grout structures. The below-grade environment for JAFNPP is not aggressive, and concrete is designed in accordance with specification ACI 318-63, "Building Code Requirements for Reinforced Concrete," which results in low permeability and resistance to aggressive chemical solutions by providing a high-cement, low-water/cement ratio (0.50 or less), proper curing, and adequate air content (between 3% and 5%). Although specified water/cement ratio's fall outside the established range of 0.35 to 0.45, given all remaining parameters for durable concrete mix design, JAFNPP concrete meets the quality requirements of ACI to ensure acceptable concrete is obtained. Therefore, cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not AERMs for JAFNPP Groups 1-5, 7, and 9 structures.

    The staff determined through discussions with the applicant's technical staff and review of bases documents, that the cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel for Groups 1-5, 7, and 9 structures are not plausible aging effects at JAFNPP due to the lack of aggressive groundwater. However, in a letter dated December 6, 2006 (Commitment No. 16), the applicant will enhance the Structures Monitoring program to perform an engineering evaluation on a periodic basis (at least once every five years) of ground water samples to assess aggressiveness (pH < 5.5, chloride > 500 ppm, and sulfate > 1500 ppm) of ground water to concrete. JAFNPP concrete is designed in accordance with specification ACI 318-63 with a high-cement, low-water/cement ratio, proper curing, and adequate air content between 3 and 6 percent. However, the above aging effects for these groups are included within the Structures Monitoring Program by the applicant. On this basis, the staff finds this acceptable.

(2) 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 in the LRA that aggressive chemical attack becomes significant to concrete exposed to an aggressive environment. Resistance to mild acid attack is enhanced by using a dense concrete with low permeability and low water-to-cement ratio of less than 0.50. These groups of structures at JAFNPP 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 to be non-aggressive. JAFNPP concrete is constructed in accordance with the recommendations in ACI 201.2R-77 for durability.

JAFNPP below-grade environment is not aggressive. Therefore, increase in porosity and permeability cracking and loss of material (spalling, scaling) due to aggressive chemical attack are not AERMs for JAFNPP 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 (spalling, scaling) due to aggressive chemical attack for Groups 1-5, 7, and 9 structures are not plausible aging effects at JAFNPP due to the lack of aggressive groundwater and the concrete being constructed for durability in accordance with the recommendations in ACI 201.2R-77. However, the above aging effects for these groups are included within the Structures Monitoring Program by the applicant. On this basis, the staff finds this acceptable.

(3) Loss of Material Due to Corrosion for Groups 1-5, 7, and 8 Structures - The applicant stated in the LRA that the JAFNPP Structures Monitoring Program will be used to manage AERMs for JAFNPP Groups 1-5, 7, and 8 structures.

The staff determined through discussions with the applicant's technical staff and a review of the basis document that the loss of material due to corrosion for Groups 1-5, 7, and 8 structures is an aging effect which will be managed by the applicant's Structures Monitoring Program. On this basis, the staff finds this acceptable.

(4) Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw for Groups 1-3, 5, and 7-9 Structures - The applicant stated in the LRA that aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw are not AERMs for JAFNPP Groups 1-3, 5, and 7-9 structures.

The staff determined through discussions with the applicant's technical staff and a review of the basis document that the loss of material (spalling, scaling) and cracking due to freeze-thaw for Groups 1-3, 5, and 7-9 structures are not plausible aging effects at JAFNPP due to concrete being constructed in accordance with ACI and ASTM standards. However, the above aging effects for these groups are included within the Structures Monitoring Program by the applicant.

On this basis, the staff finds this acceptable.

(5) Cracking Due to Expansion and Reaction with Aggregates for Groups 1-5 and 7-9 Structures - The applicant stated in the LRA that the aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, cracking due to expansion and reaction with aggregates for Groups 1-3, 5, and 7-9 structures is not an AERM.

The staff determined through discussions with the applicant's technical staff and a review of the basis document that the cracking due to expansion and reaction with aggregates for Groups 1-5 and 7-9 structures are not plausible aging effects at JAFNPP due to concrete being constructed in accordance with ACI and ASTM standards with a high-cement, low-water/cement ratio. However, the above aging effects for these groups are included within the Structures Monitoring Program by the applicant. On this basis, the staff finds this acceptable.

(6) Cracks and Distortion Due to Increased Stress Levels from Settlement for Groups 1-3 and 5-9 Structures

The applicant stated in the LRA that the Groups 1-3 and 5-9 structures at JAFNPP, settlement is not a credible event since structures and founded on bedrock. Therefore, cracks and distortion due to increased stress levels from settlement for Groups 1-3 and 5-9 structures is not an AERM for JAFNPP concrete.

The staff determined through discussions with the applicant's technical staff and a review of the basis document 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 due to the nonexistence of these aging mechanisms. The applicant states that the aging effects due to settlement are not expected at JAFNPP for Groups 1-3 and 5-9 Class 1 structures. The JAFNPP Class 1 structures are founded on sound bedrock or supported by steel pilings which prevent significant settlement. The staff finds acceptable the applicant's assessment that these aging effects are not applicable to JAFNPP Class 1 structures. On the basis that JAFNPP does not have any components from this group, the staff found that this aging effect is not applicable to JAFNPP.

(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 applicant stated in the LRA that the JAFNPP concrete was provided in accordance with ACI 318-63 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 is also eliminating the possibility of loss of soil resulting in voids below the subgrade. 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 AERMs for JAFNPP Groups 1-3 and 5-9 structures.

The staff determined through discussions with the applicant's technical staff 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 due to the nonexistence of these aging mechanisms. The applicant states 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 JAFNPP since there are no porous concrete subfoundations of concern below these structures. The staff finds acceptable the applicant's assessment that these aging effects are not applicable to JAFNPP Groups 1-3 and 5-9 structures.

(8) Lockup Due to Wear for Lubrite® Radial Beam Seats in BWR Drywell and Other Sliding Support Surfaces - The applicant stated in the LRA that owing to wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces, lockup due to wear is not an AERM at JAFNPP. However, Lubrite® plates are included within the Structures Monitoring Program and Inservice Inspection (ISI-IWF) Programs to confirm the absence of AERMs for this component.

The staff determined through discussions with the applicant's technical staff that the lockup due to wear for Lubrite® radial beam seats in BWR drywell and other sliding support surfaces is not a plausible aging effect at JAFNPP due to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces. However, the above aging effects for Lubrite® components associated with the JAFNPP drywell beam seats are included within the Structures Monitoring Program by the applicant.

The staff determined through discussions with the applicant's technical staff that the applicant has included the above eight structure/aging effect combinations in its Structures Monitoring Program, and no further evaluation is required in accordance with the GALL Report. However, although not required, the applicant has elected to provide further evaluation for each of the eight aging effects referenced above. The staff found this additional evaluation acceptable.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.1. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging Management of Inaccessible Areas. The staff reviewed LRA Section 3.5.2.2.2.2 against the SRP-LR Section 3.5.2.2.2.2 criteria.

In LRA Section 3.5.2.2.2.2, the applicant stated that JAFNPP concrete for Groups 1-3, 5, and 7-9 inaccessible concrete areas was provided in accordance with specification ACI 318-63, "Building Code Requirements for Reinforced Concrete," which requires the following, resulting in low permeability and resistance to aggressive chemical solution:

- high cement content
- low water permeability
- proper curing
- adequate air entrainment

JAFNPP concrete also meets the requirements of later ACI guide ACI 201.2R-77, "Guide to Durable Concrete," since both documents use the same ASTM standards for selection, application, and testing of concrete.

Inspections of accessible concrete have not revealed degradation related to corrosion of embedded steel. The site's below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1500 ppm). Therefore, corrosion of embedded steel is not an AERM for JAFNPP concrete.

The staff reviewed LRA Section 3.5.2.2.2.2 against the SRP-LR Section 3.5.2.2.2.2 criteria.

(1) Loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Groups 1-3, 5 and 7-9 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas of these groups of structures for plants located in moderate to severe weathering conditions.

(2) Cracking due to expansion and reaction with aggregates could occur in below-grade inaccessible concrete areas for Groups 1-5 and 7-9 structures. The GALL Report recommends further evaluation of inaccessible areas of these groups of structures if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77.

(3) Cracks and distortion due to increased stress levels from settlement and reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The existing program relies on structures monitoring program to manage these aging effects. Some plants may rely on a de-watering system to lower the site ground water level. If the plant's CLB credits a de-watering system, the GALL Report recommends verification of the continued functionality of the de-watering system during the period of extended operation. The GALL Report recommends no further evaluation if this activity is included within the scope of the applicant's structures monitoring program.

(4) Increases in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel could occur in 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 if the environment is aggressive.

(5) Increases in porosity and permeability, and loss of strength due to leaching of calcium hydroxide could occur in below-grade inaccessible concrete areas of Groups 1-3, 5, and 7-9 structures. The GALL Report recommends further evaluation of this aging effect for inaccessible areas of these groups of structures if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77.

The staff determined through discussions with the applicant's technical staff that the aging management of inaccessible areas due to aggressive chemical attack for Groups 1-5, 7, and 9 structures are not plausible aging effects at JAFNPP due to the lack of aggressive groundwater and the concrete being constructed in accordance with the recommendations in ACI 201.2R-77 for durability with a high-cement, low-water/cement ratio. The applicant will perform opportunistic inspections of inaccessible concrete areas when they become accessible under the Buried Piping Inspection Program and the Structures Monitoring Program. In its response dated December 6, 2006, the applicant provided a list of commitments. Commitment No. 16 will revise the Structures Monitoring Program to require opportunistic inspections of inaccessible concrete areas when they become accessible. Furthermore, as part of the structural monitoring program, the applicant will continue to perform periodic groundwater monitoring to confirm lack of aggressiveness.

The staff found that, based on the programs identified above and the commitment, the applicant has met the criteria of SRP-LR Sections 3.5.2.2.2.2.1 through 3.5.2.2.2.2.5 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.2. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 3.5.2.2.2.3 against the criteria in SRP-LR Section 3.5.2.2.2.3.

In LRA Section 3.5.2.2.2.3, the applicant stated that ACI 349 specifies concrete temperature limits for normal operations or any other long-term period. The temperatures shall not exceed 150 °F except for local areas, which are allowed to have increased temperatures not to exceed 200 °F.

Groups 1-5 concrete elements do not exceed the temperature limits associated with aging degradation due to elevated temperature. Therefore, reduction of strength and modulus of concrete due to elevated temperatures is not an AERM for JAFNPP.

SRP-LR Section 3.5.2.2.2.3 states that reduction of strength and modulus of concrete due to elevated temperatures could occur in PWR and BWR Group 1-5 concrete structures. For any concrete elements that exceed specified temperature limits, further evaluations are recommended. Appendix A of ACI 349-85 specifies the concrete temperature limits for normal operation or any other long-term period. The temperatures shall not exceed 150 °F except for local areas, which are allowed to have increased temperatures not to exceed 200 °F. The GALL Report recommends further evaluation of a plant-specific program if any portion of the safety-related and other concrete structures exceeds specified temperature limits (i.e., general area temperature greater than 66 °C (150 °F) and local area temperature greater than 93 °C (200 °F)).

The staff determined through discussions with the applicant's technical staff that the reduction of strength and modulus of concrete structures due to elevated temperatures is not a plausible aging effect due to the nonexistence of these aging mechanisms. The applicant states that the aging effects due to elevated temperature are not expected at JAFNPP for the concrete associated with Groups 1-5 structures since general area temperatures within the primary containment do not exceed 150°F and local area temperatures do not exceed 200°F. The staff finds acceptable the applicant's assessment that these aging effects are not applicable to the JAFNPP Groups 1-5 structures concrete.

During the audit and review, the staff asked the applicant to provide the maximum temperatures that concrete experiences in Groups 1-5 structures.

During interviews with the staff, the applicant's technical staff stated that the JAFNPP concrete is expected to experience a maximum, normal operation temperature of 150°F (UFSAR Table 5.2-3). For structures outside the drywell, the bulk area maximum temperature is 120°F for Groups 1-5 structures as identified in UFSAR Section 7.1.12. Concrete within the drywell consists of the reactor pedestal, sacrificial shield wall, and the drywell floor. Assurance that bulk concrete temperatures within the drywell remain below 150°F is obtained through maintaining average bulk containment temperature within the limits allowed by JAFNPP Technical Specification Section B3.6.1.5. Although upper elevations of the drywell may exceed 150°F, the concrete of the drywell is at lower elevations. The drywell cooling system provides cooling to ensure temperature limits are not exceeded. The highest concrete temperature in the drywell is at the sacrificial shield wall. The concrete in this wall is not load bearing.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.3. For those line items that apply to LRA Section 3.5.2.2.2.3, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 SRP-LR Section 3.5.2.2.2.4 criteria.

For inaccessible areas of certain Group 6 structures, aging effects are covered by inspections in accordance with the Structures Monitoring Program.

(1) LRA Section 3.5.2.2.2.4 states that below-grade exterior reinforced concrete at JAFNPP is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Therefore, increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel are not AERMs for below-grade inaccessible concrete areas of JAFNPP Group 6 structures.

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 could 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 if the environment is aggressive.

The staff determined through discussions with the applicant's technical staff that the increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack; and cracking, loss of bond), and loss of material (spalling, scaling)/corrosion of embedded steel in below-grade inaccessible concrete areas of Group 6 structures are not significant aging effects at JAFNPP due to the lack of aggressive groundwater and the concrete being constructed for durability with a high-cement, low-water/cement ratio, in accordance with the recommendations in ACI 201.2R-77. The applicant will perform opportunistic inspections of inaccessible concrete areas when they become accessible under the Buried Piping Inspection Program and the Structures Monitoring Program. In its response dated December 6, 2006, the applicant provided a list of commitments. Commitment No. 16 will revise the Structures Monitoring Program to require opportunistic inspections of inaccessible concrete areas when they become accessible. Furthermore, as part of the structural monitoring program, the applicant will continue to perform periodic groundwater monitoring to confirm lack of aggressiveness.

The staff finds that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4.1 for further evaluation.

(2) In LRA Section 3.5.2.2.2.4, the applicant stated that for the loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to JAFNPP because the aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw are not AERMs for JAFNPP Group 6 structures.

SRP-LR Section 3.5.2.2.2.4 states that loss of material (spalling, scaling) and cracking due to freeze-thaw could occur in below-grade inaccessible concrete areas of Group 6 structures. The GALL Report recommends further evaluation of this aging effect for

inaccessible areas for plants located in moderate to severe weathering conditions.

The staff determined through discussions with the applicant’s technical staff that the loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Group 6 structures are not aging effects at JAFNPP due to concrete being constructed in accordance with ACI and ASTM standards with a high-cement, low-water/cement ratio. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained during the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff finds that, based on the programs identified above and the LRA amendment, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4.2 for further evaluation.

(3) In LRA Section 3.5.2.2.2.4, the applicant addressed that for cracking due to expansion and reaction with aggregates, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in below-grade inaccessible concrete areas of Group 6 structures, this aging effect is not applicable to JAFNPP because the aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction, which are in accordance with the recommendations in ACI 201.2R-77 for concrete durability. JAFNPP structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios are within the limits provided in ACI 318-63, and air entrainment percentages were within the range prescribed in the GALL Report. JAFNPP below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1500 ppm).

SRP-LR Section 3.5.2.2.2.4 states that cracking due to expansion and reaction with aggregates and increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide could occur in below-grade inaccessible reinforced concrete areas of Group 6 structures. The GALL Report recommends further evaluation of inaccessible areas if concrete was not constructed in accordance with the recommendations in ACI 201.2R-77.

The staff determined through discussions with the applicant’s technical staff that the 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 is not an aging mechanism for JAFNPP concrete. The staff determined through discussions with the applicant’s technical staff 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 JAFNPP due to concrete being constructed in accordance with ACI and ASTM standards with a high-cement, low-water/cement ratio and the below-grade environment being nonaggressive. However, the above aging effects for this group are included within the Structures Monitoring Program by the applicant.

The staff found that, based on the programs identified above and the LRA amendment, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4(3) for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.4. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Cracking Due to Stress Corrosion Cracking and Loss of Material Due to Pitting and Crevice Corrosion. The staff reviewed LRA Section 3.5.2.2.2.5 against the criteria in SRP-LR Section 3.5.2.2.2.5.

In LRA Section 3.5.2.2.2.5, the applicant stated that no tanks with SS liners are included in the structural AMRs. Tanks subject to AMR are evaluated with their respective mechanical systems.

SRP-LR Section 3.5.2.2.2.5 states that cracking due to stress corrosion cracking and loss of material due to pitting and crevice corrosion could occur for Group 7 and 8 stainless steel tank liners exposed to standing water. The GALL Report recommends further evaluation of plant-specific programs to manage these aging effects.

The staff determined through discussions with the applicant's technical staff that the cracking due to SCC and loss of material due to pitting and crevice corrosion are not AERMs at JAFNPP since there are no tanks with SS liners included in the structural AMRs. Tanks subject to an AMR are evaluated with their respective mechanical systems.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.5. For those line items that apply to LRA Section 3.5.2.2.2.5, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

Aging of Supports Not Covered by Structures Monitoring Program. The staff reviewed LRA Section 3.5.2.2.2.6 against the criteria in SRP-LR Section 3.5.2.2.2.6.

In LRA Section 3.5.2.2.2.6, the applicant addressed that the GALL Report recommends further evaluation of certain component support/aging effect combinations if they are not covered by the applicant's Structures Monitoring Program. Component supports at JAFNPP are included in the Structures Monitoring Program for Groups B2 through B5 and Inservice Inspection (ISI-IWF) Program for Group B1.

SRP-LR Section 3.5.2.2.2.6 states that the GALL Report recommends further evaluation of certain component support/aging effect combinations if they are not covered by the structures monitoring program. This includes (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 structures monitoring program.

(1) Reduction in concrete anchor capacity due to degradation of the surrounding concrete for Groups B1 through B5 supports.

    JAFNPP concrete anchors and surrounding concrete are included in the Structures Monitoring Program (Groups B2 through B5) and Inservice Inspection (ISI-IWF) Program (Group B1).

(2) Loss of material due to general and pitting corrosion for Groups B2 through B5 supports

    Loss of material due to corrosion of steel support components is an AERM at JAFNPP. This aging effect is managed by the Structures Monitoring Program.

(3) Reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports

    The JAFNPP AMR did not identify any component support structure/aging effect combination corresponding to the GALL Report, Volume 2, Item III.B4.2-a.

The staff finds that the applicant has included the above AEM combinations within the scope of its Structures Monitoring Program or Inservice Inspection (IWF) Program and finds that no further evaluation is required. The staff determined through discussions with the applicant's technical staff that reduction/loss of isolation function due to degradation of vibration isolation elements for Group B4 supports is not an AERM at JAFNPP since there are no vibration isolation components within the scope of license renewal. The staff reviewed the applicant's Structures Monitoring Program and Inservice Inspection (IWF) Program, and these evaluations are documented in Section 3.0.3.2.18 and Section 3.0.3.3.3 of this SER, respectively. The staff finds the applicant's Structures Monitoring Program and Inservice Inspection (IWF) Program acceptable for managing the above AEM combinations of component supports for the GALL Report component support Groups B1 through B5, as those combinations are applicable.

The staff found that, based on the programs identified above, the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.6 for further evaluation.

Based on the programs identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.5.2.2.2.6. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB during the period of extended operation, as required by 10 CFR 54.21(a)(3).

<u>Cumulative Fatigue Damage Due to Cyclic Loading</u>. In LRA Section 3.5.2.2.2.7, the applicant stated that TLAAs are evaluated in accordance with 10 CFR 54.21(c) as documented in LRA Section 4. During the process of identifying TLAAs in the JAFNPP CLB, no fatigue analyses were identified for component support members, anchor bolts, and welds for Groups B1.1, B1.2,

and B1.3.

The staff determined through discussions with the applicant's technical personnel that there are no CLB fatigue analyses for component support members, anchor bolts, and welds for Groups B1.1, B1.2, and B1.3 and, therefore, cumulative fatigue damage cannot be evaluated as an aging effect for these components. Therefore, cumulative fatigue damage for Groups B1.1, B1.2 and B1.3 component supports is not a TLAA as defined in 10 CFR 54.3.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

SER Section 3.0.4 provides the staff's evaluation of the applicant's QA program safety-related and nonsafety-related components.

3.5.2.3 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Tables 3.5.2-1 through 3.5.2-4, the staff reviewed additional details concerning the results of the AMRs for material, environment, AERM, and AMP combinations that are not consistent with the GALL Report, or that are not addressed in the GALL Report.

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant indicated, via notes F through J, that the combination of component type, material, environment, and AERM does not correspond to a line item in the GALL Report. The applicant provided further information concerning how the aging effects will be managed. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is discussed in the following sections.

Structure and Component Supports AMR Line Items That Have No Aging Effects (LRA Tables 3.5.2-1 through 3.5.2-4). In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from concrete material are exposed to a protected-from-weather, exposed-to-weather, or fluid environment. In the LRA, the applicant states that inaccessible and accessible concrete areas are designed in accordance with ACI specification ACI 318-63, "Building Code Requirements for Reinforced Concrete," which results in low permeability and resistance to aggressive chemical solutions by requiring the following:

- high cement content
- low water-to-cement ratio
- proper curing
- adequate air entrainment

JAFNPP concrete also meets requirements of later ACI guide ACI 201.2R-77, “Guide to Durable Concrete,” since both ACI documents use the same ASTM standards for selection, application, and testing of concrete. The below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1500 ppm). Concrete was provided with air content between 3 and 5% and, in general, a water/cement ratio between 0.44 and 0.60. Therefore, increase in porosity and permeability due to leaching of calcium hydroxide, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, and cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel are not applicable to concrete in accessible and inaccessible areas.

Aggregates used at JAFNPP were in accordance with specifications and materials conforming to ACI and ASTM standards. JAFNPP concrete structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw and cracking due to expansion and reaction with aggregates are not AERMs for JAFNPP structures. ASME Code, Section III, Division 2, Subsection CC, indicates that aging due to elevated temperature exposure is not significant as long as concrete general area temperatures do not exceed 150°F and local area temperatures do not exceed 200°F. During normal operation, areas within the JAFNPP primary containment and other structures are within these temperature limits. Therefore, reduction of strength and modulus of concrete structures due to elevated temperature is not an AERM for JAFNPP concrete. However, the applicant has elected to confirm the absence of concrete aging effects under its Structures Monitoring Program.

The staff found that the quality of the reinforced concrete used at JAFNPP meets the codes and standards referenced in the GALL Report such that the concrete is not susceptible to the aging effects listed above. The below-grade environment was found not to be aggressive at JAFNPP, with continuing groundwater monitoring to occur during the period of extended license. Therefore, no aging effects are considered to be applicable to components fabricated from concrete material protected from weather, exposed to weather, or exposed to fluid environments. However, JAFNPP will confirm the absence of concrete aging effects under its Structures Monitoring Program.

On the basis of its review of current industry research and operating experience, the staff found that protected-from-weather, exposed-to-weather, or exposed-to-fluid concrete components will not result in aging that will be of concern during the period of extended operation. The staff finds that the applicant’s AMR evaluations concerning potential aging effects are acceptable. Therefore, the staff concluded that there are no applicable AERMs for concrete components exposed to protected-from-weather, exposed-to-weather, or exposed-to-fluid environments

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from Lubrite® plate material were in a protected-from-weather environment. In the LRA, the applicant

states that Lubrite® plates are used in the drywell beam seats and the torus support saddles at JAFNPP. Lubrite® materials for nuclear applications are designed to resist deformation, have a low coefficient of friction, resist softening at elevated temperatures, resist corrosion, withstand high intensities of radiation, and not score or mar; therefore, they are not susceptible to AERMs. Due to the wear-resistant material used, the low frequency (number of times) of movement, and the slow movement between sliding surfaces, lockup and loss of mechanical function of Lubrite® plates from wear, corrosion, distortion, dirt, overload, and fatigue due to vibratory and cyclic thermal loads are not considered to be AERMs at JAFNPP. Nonetheless, Lubrite® plates are included within the Structures Monitoring Program and Inservice Inspection (IWF) Program. The staff found that industry operating experience and JAFNPP ISI inspection reports for slide-bearing plates have identified no recordable degradation due to any aging effects. Therefore, no aging effects are considered to be applicable to components fabricated from Lubrite® plate material exposed to a protected-from-weather environment.

On the basis of its review of current industry research and operating experience, the staff found that a protected-from-weather environment on Lubrite® plate will not result in aging that will be of concern during the period of extended operation. The staff finds acceptable the applicant's AMR evaluations that Lubrite® plate in a protected-from-weather environment will have no identified aging effects that actually occur. Therefore, the staff concluded that there are no applicable AERMs for Lubrite® plate components exposed to a protected-from-weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from aluminum material were in a exposed-to-weather environment.

In the LRA, the applicant states that the ambient environment at JAFNPP is not chemically polluted by vapors of sulfur dioxide or other similar substances and the external environment does not contain saltwater or high chlorides. In this nonaggressive environment, the occasional wetting and drying from normal outdoor weather does not result in any significant loss of material for aluminum components. Therefore, loss of material due to pitting and crevice corrosion is not an AERM for aluminum components exposed to a weather environment. The staff found that industry operating experience and previously approved staff positions support the conclusion that there are no aging effects for aluminum in a weather environment. Therefore, no aging effects are considered to be applicable to components fabricated from aluminum material exposed to a weather environment.

On the basis of its review of current industry operating experience and approved staff positions, the staff found that a weather environment on aluminum at JAFNPP will not result in aging that will be of concern during the period of extended operation. The staff finds acceptable the applicant's AMR evaluations that aluminum in a weather environment will have no identified aging effects that actually occur. Therefore, the staff concluded that there are no applicable AERMs for aluminum components exposed to a weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from SS material were in a exposed-to-weather environment.

In the LRA, the applicant states that the ambient environment at JAFNPP is not chemically polluted by vapors of sulfur dioxide or other similar substances and the external environment does not contain saltwater or high chlorides. In this nonaggressive environment, the occasional wetting and drying from normal outdoor weather does not result in any significant loss of material for SS components. Therefore, loss of material due to pitting and crevice corrosion is not an AERM for SS components exposed to a weather environment. The staff found that industry operating experience and previously approved staff positions support the conclusion that there are no aging effects for SS in a weather environment. Therefore, no aging effects are considered to be applicable to components fabricated from SS material exposed to a weather environment.

On the basis of its review of current industry operating experience and approved staff positions, the staff found that a weather environment on SS at JAFNPP will not result in aging that will be of concern during the period of extended operation. The staff finds acceptable the applicant's AMR evaluations that SS in a weather environment will have no identified aging effects that actually occur. Therefore, the staff concluded that there are no applicable AERMs for SS components exposed to a weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from Pyrocrete® material were in a protected-from-weather environment.

The staff noted that in LRA Table 3.5.2-4 (page 3.5-82), for component fireproofing, the aging effect for Pyrocrete® material in a protected-from-weather environment is none.

During the audit and review, the staff asked the applicant to provide a technical basis as to why Pyrocrete® does not have any aging effects in the environment listed.

During interviews with the staff, the applicant's staff stated that Pyrocrete® (used for fireproofing) is a cement base composite material. Pyrocrete® is not identified in the GALL Report. As such, JAFNPP's technical evaluation of Pyrocrete® in determining applicable aging effects was the same as that for concrete, which is based on EPRI 1002950, "Aging Effects for Structures and Structural Components (Structural Tools)," Revision 1, Section 5. Accordingly, no aging effects were determined for Pyrocrete® protected from weather. However, as indicated in LRA Table 3.5.2-4 (page 3.5-82), the Fire Protection Program and Structures Monitoring Program will confirm the absence of significant aging effects throughout the period of extended operation.

The staff found Pyrocrete® to be a cementitious material that, like concrete in a protected-from-weather environment, will not experience aging effects. Industry operating experience supports the conclusion that there are no aging effects for Pyrocrete® in a protected-from-weather environment. Therefore, no aging effects are considered to be applicable to components fabricated from Pyrocrete® material exposed to a protected-from-weather environment. Nonetheless, Pyrocrete® is included within the Fire Protection Program and Structures Monitoring Program to ensure aging effects such as cracking or loss of material are not occurring.

On the basis of current industry research and operating experience, the staff found that a protected-from-weather environment on Pyrocrete® at JAFNPP will not result in aging that will be of concern during the period of extended operation. The staff finds acceptable the applicant's AMR evaluations that Pyrocrete® in a protected-from-weather environment will have no identified aging effects that actually occur. Therefore, the staff concluded that there are no applicable AERMs for Pyrocrete® components exposed to a protected-from-weather environment.

In LRA Tables 3.5.2-1 through 3.5.2-4, the applicant identified AMR line items where no aging effects were identified as a result of its aging review process. Specifically, instances in which the applicant states that no aging effects were identified occurred when components fabricated from fiberglass, calcium silicate, or Stratafab® material were in a protected-from-weather environment. In the LRA, the applicant states that loss of insulating characteristics due to insulation degradation is not an AERM for insulation material. Insulation products (*i.e.,* made from fiberglass fiber, calcium silicate, SS, and similar materials) that are protected from weather do not experience aging effects that would significantly degrade their ability to insulate as designed. A review of site operating experience identified no aging effects for insulation used at JAFNPP. No aging effects are considered to be applicable to components fabricated from fiberglass, calcium silicate, or Stratafab® material exposed to a protected-from-weather environment.

On the basis of its review of current industry research and operating experience, the staff found that a protected-from-weather environment on fiberglass, calcium silicate, or Stratafab® will not result in aging that will be of concern during the period of extended operation. Therefore, the staff concluded that there are no applicable AERMs for fiberglass, calcium silicate, or Stratafab® components exposed to protected-from-weather environments.

3.5.2.3.1 Reactor Building and Primary Containment Summary of Aging Management Evaluation – LRA Table 3.5.2-1

The staff reviewed LRA Table 3.5.2-1, which summarizes the results of AMR evaluations for the reactor building and primary containment component groups.

In LRA Table 3.5.2-1 under Structure and/or Component or Commodity "drywell shell," "drywell to vent system," and "torus shell," JAFNPP Containment Inservice Inspection (CII) and Containment Leak Rate Programs are credited to manage loss of material due to general, pitting, and crevice corrosion.

In RAI 3.5.2-1 dated January 12, 2007, the staff requested that the applicant verify that these programs include the aging effects on both accessible and inaccessible areas.

In its response dated February 12, 2007, the applicant stated that, as shown in LRA Table 3.5.2-1, loss of material for drywell shell, drywell to torus vent system and torus shell is managed by the Containment Inservice Inspection (CII) Program and the Containment Leak Rate Program. These programs manage the effects of aging on both accessible and inaccessible areas when they become accessible, when inspection results of similar component show significant degradation, or when operating experience warrants such inspections. As stated in LRA Section B.16.1, the Containment Inservice Inspection (CII) Program cites 10 CFR 50.55a(b)(2)(ix), which specifies additional requirements for inaccessible areas. 10 CFR 50.55a(b)(2)(ix) states that the licensee is to evaluate the acceptability of inaccessible

areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas. As stated in LRA Section B.1.8, the Containment Leak Rate Program uses the 10 CFR Part 50, Appendix J program described in GALL Report Section XI.S4. This program monitors leakage rates through containment shells; containment liners; and associated welds, penetrations, fittings, and other access openings. This monitoring program addresses leakage through inaccessible areas such as the embedded containment or drywell shell.

The staff finds the applicant's response to RAI 3.5.2-1 acceptable because the applicant has adequate programs to manage the aging of accessible and inaccessible areas of the containment. Therefore, the staff's concern described in RAI 3.5.2-1 is resolved.

In LRA Table 3.5.2-1 under Structure and/or Component or Commodity "drywell shell," and "torus shell," the Containment Inservice Inspection Program is credited to manage the loss of material due to general pitting and crevice corrosion. Operating experience in the AMP stated, "Results of the CII general visual walkdown of primary containment during RO15 (2002) revealed minor areas of peeling paint and rust scale."

In RAI 3.5.2-2 dated January 12, 2007, the staff requested that the applicant provide the root cause and any preventive actions taken to alleviate the instances of peeling paint and rust scale in primary containment.

In its response dated February 12, 2007, the applicant stated that during the ROs in 2002, 2004 and 2006, a general visual walkdown of the primary containment for IWE was performed for the various elevations from 256'-6" to 331'-0". The walkdowns revealed surface areas minor in size which were found to have cracking/peeling paint and/or evidence of rust scale. In 2002, the degraded conditions were identified in CR-JAF-2003-02527 and maintenance activities were completed per Work Order JF-030619900. The cracking/peeling paint is apparently caused by improper cleaning and preparation of the steel substrate and the coating delaminating from the surface. Identified areas of concern have been determined to be minor surface degradations and have been repaired. JAFNPP will continue to perform a general visual walkdown of Primary Containment in accordance with the IWE during refueling outages. Any degraded conditions identified will be evaluated in the Corrective Action Program for appropriate repair as required.

The staff finds the applicant's response to RAI 3.5.2-2 acceptable. The staff found the applicant's programs for managing the aging of drywell and torus shell acceptable because the proper implementation of the programs will ensure the integrity of these components during the extended period outages. Therefore, the staff's concern described in RAI 3.5.2-2 is resolved.

In LRA Table 3.5.2-1 under Structure and/or Component or Commodity "drywell shell," JAFNPP CII and Containment Leak Rate Programs are credited to manage the loss of material due to general pitting and crevice corrosion. However, it was unclear to the staff how and when inspections were performed to verify that there has been no observed leakage causing moisture in the vicinity of the sand cushion at JAFNPP and that no moisture has been detected or is suspected on the inaccessible areas of the drywell shell which would result in corrosion and wall thinning.

In RAI 3.5.2-3 dated January 12, 2007, the staff requested that the applicant address proposed license renewal interim staff guidance LR-ISG-2006-01, “Plant Specific Aging Management Program for Inaccessible Areas of Boiling Water Reactor Mark 1 Steel Containment Drywell Shell,” which was published in the Federal Register on May 9, 2006. Also, the staff requested that the applicant provide significant findings during the implementation of, and subsequent examinations to GL 87-05, “Request for Additional Information-Assessment of Licensee Measures to Mitigate And/Or Identify Potential Degradation of Mark I Drywells.”

In its response dated February 12, 2007, the applicant provided detail of how the NRC generic communication relates to the potential for corrosion of the Mark I steel containment and provided additional information on the JAFNPP drywell shell relative to recent industry experience. In its response, the applicant described the purpose, background, JAFNPP primary containment design, drywell shell exterior, drywell shell interior and operating experience and actions taken to prevent drywell corrosion. Based on the applicant’s response, the staff requested the following additional information for the drywell shell exterior via letter dated April 2, 2007:

1. Under paragraph ‘Drywell Shell Exterior,’ the applicant states JAFNPP determined that only one out of four air gap drain lines is required to performed the function for which they were designed, the draining of condensates that may form in the air gap. The staff requested JAFNPP to explain the bases for this requirement.

2. The staff also requested the applicant to address conditions of the stainless steel plates and adhesive that are used to cover the sand cushion.

In its response dated April 24, 2007, the applicant stated:

1. The architect engineer, Stone & Webster (SWEC) stated that one of the four upper sand cushion drain lines would be sufficient to perform the function of draining any condensates which may form in the two inch air gap. Per Attachment 1 to NYPA Memorandum #JTS-88-0848, dated November 8, 1988, SWEC stated that their search of the project files, including specifications, calculations and job books did not locate any design basis for these drains. SWEC further stated that based on a preliminary evaluation, one 2” drain line would have enough capacity to drain any moisture resulting from condensation on the drywell shell. Also, any condensation caused by cooling of the drywell would return to the vapor state when the drywell heats up. Therefore, condensation should not be considered a major concern.

2. As stated in LRA Amendment #6, JAFP-07-0021, page 16, JAFNPP stated that additional examination of the drywell air gap will be performed in 2007. Preliminary details of the examination are discussed in the RAI 2.4.1-3 in the letter dated April 24, 2007.

The staff finds the applicant’s response to RAI 3.5.2-3 acceptable because the applicant (1) determined that one 2" drain line would have enough capacity to perform its intended functions

and (2) the applicant did examine the air gap through the drain lines and no evidence of moisture was identified until now. In addition, applicant will perform additional inspections as required. The staff's concern described in RAI 3.5.2-3 is resolved.

In LRA Table 3.5.2-1 under Structure and/or Component or Commodity "drywell to torus vent system," and "drywell to torus vent line bellows," Containment Inservice Inspection (CII) and Containment Leak Rate Programs are credited to manage loss of material due to general pitting crevice corrosion and cracking. The vent system, as well as the vent line bellows, may be inaccessible and likely to be subject to corrosion (see IN 92-20).

In RAI 3.5.2-4 dated January 12, 2007, the staff requested that the applicant provide operating experience and information regarding how the AMPs will manage aging effects of these components through the period of extended operation.

In its response dated February 12, 2007, the applicant explained that the drywell to torus vent system and drywell to torus line bellows are accessible for inspection. As shown in LRA Table 3.5.2-1, cracking of stainless steel bellows and loss of material (due to corrosion) of carbon steel drywell to torus vent system are managed by the Containment Inservice Inspection (CII) Containment Leak Rate Programs. These programs are the same as those identified in GALL Report for managing aging effects of these components. Operating experience review at JAFNPP found no evidence of degradation related to general, pitting and crevice corrosion, and cracking of the "drywell to torus vent system," and "drywell to torus vent line bellows."

By letter dated April 2, 2007, the staff requested that the applicant explain how the vent pipe bellows are monitored for loss of material due to general pitting crevice corrosion and cracking and if the applicant has considered Type B test per 10 CFR Part 50, Appendix J.

During a March 05, 2007 teleconference, the staff pointed out that Type B test will detect age related degradation in the bellows (i.e. cracking of bellows), if the bellows are single-plied. However, if the bellows are double-plied, the applicant has to develop specialized Type B test, so that the space between the two plies can be pressurized, or the applicant has to perform Type A tests for that purpose.

In its response dated April 24, 2007, the applicant indicated that it performs the aging management of containment bellows utilizing Type B tests every 10 years in accordance with the requirements of Appendix J. The April 24, 2007 response does not address the staff concern.

Further, by letter dated June 20, 2007 the applicant responded that the vent line to torus penetration bellows consist of two sections of two-ply stainless steel bellows. Type B LLRT testing consists of pressurizing the space between the two plies of each bellows section, and measuring leakage as inlet flow to this space. This effectively tests all of the surface area of each bellows section. The rest of the penetration assembly, including the vent insert in the torus shell and mounting plates connecting the bellows to the vent piping and vent insert, is carbon or stainless steel of welded construction. Type A ILRT testing includes pressurizing the assembly from the torus airspace, and measuring leakage as inlet flow to the containment. This effectively tests all of the surface area of the assembly except the two, two-ply bellows sections. Therefore, the combination of Type A and Type B testing effectively tests the entire assembly. As noted in the response to JAFNPP audit question 200, there is no history at JAFNPP of exposure of this

material to corrosive contamination; neither is there any history of corrosion or other degradation of the assembly. There is no history of leakage of the bellows assemblies under Type A or Type B testing. Exposed inner (i.e., torus side) surfaces of the assemblies are viewed during Type B testing and during other torus internal inspections. There is no convenient method for inspecting the unexposed portions of the assemblies, and no perceived need to do so in light of the available history.

Based on its review, the staff finds the applicant's response to RAI 3.5.2-4 acceptable because the applicant tests all surface areas of the assembly except the two-ply bellows sections. The bellows sections are tested by Type B test per 10 CFR Part 50, Appendix J. Therefore, the entire assembly is tested. The staff's concern described in RAI 3.5.2-4 is resolved.

In LRA Table 3.5.2-1, under Structure and/or Component or Commodity "torus shell," the Containment Inservice Inspection and Containment Leak Rate Programs are credited to manage loss of material due to general pitting and crevice corrosion. According to IN 2006-01, "Torus Cracking in a BWR Mark I Containment," dated January 12, 2006, the most likely cause of the through-wall torus crack was cyclic loading due to condensation oscillation during HPCI operation.

In RAI 3.5.2-5 dated January 12, 2007, the staff requested that the applicant include cracking as an AERM. Also, the staff requested that the applicant provide information on how other areas of the torus that are susceptible to cracking and/or pitting corrosion are managed in order to provide reasonable assurance that the torus will function properly through the period of extended operation.

In its response dated February 12, 2007, the applicant stated that in reference to IN 2006-01, the cause of the torus crack was the cyclic loading resulting from a design flaw. Specifically, the turbine exhaust pipe had no sparger, such that during HPCI operation hydrodynamic loading was imposed on the torus. Since the flaw resulted from inadequate design rather than aging effect, an aging management program would not be an appropriate corrective action. The corrective action for the inadequate design was a design change which included installing a sparger on the exhaust pipe. The other areas of the torus are not susceptible to cracking and areas susceptible to pitting corrosion are included in the aging management programs shown in Table 3.5.2-1. The Containment Inservice Inspection (CII) Program manages loss of material through visual inspections as described in LRA Section B.16.1.

Based on its review, the staff finds the applicant's response to RAI 3.5.2-5 acceptable because the applicant explained that the cause of the torus crack was the cyclic loading resulting from a design flaw and it is not part of the aging management program. The corrective action for inadequate design was fixed by installing a sparger. Moreover, the applicant stated that the other susceptible areas of the torus for cracking and pitting corrosion are included in the aging management program. The staff's concern described in RAI 3.5.2-5 is resolved.

In LRA Table 3.5.2-1, under Structure and/or Component or Commodity "drywell shell," and "torus shell," JAFNPP indicated no TLAA. An absence of TLAA related to drywell and torus corrosion indicates that both of these containment components have not experienced degradation that requires such an analysis.

In RAI 3.5.2-6 dated January 12, 2007, the staff requested that the applicant justify why a TLAA is not required for either of these components.

In its response dated February 12, 2007, the applicant stated that the absence of a TLAA related to drywell and torus corrosion does not indicate that these components have not experienced corrosion. The lack of a TLAA indicates that no analysis exists that meets the definition of TLAA in 10 CFR 54.3, and that the original design required no time-limited analysis. Corrosion has, in fact, been observed for the materials and environments associated with the drywell and torus. As indicated in LRA Table 3.5.2-1, the Containment Inservice Inspection (CII) and Containment Leak Rate Programs manage loss of material, which is an aging effect caused by corrosion. These programs are the same as those identified in the GALL Report for managing aging effects of these components. In addition, as shown in Table 3.5.2-1, the torus shell references TLAA – metal fatigue. LRA Section 4.6 discusses the evaluation of metal fatigue for the torus and attached piping. This is the only TLAA associated with the primary containment.

Based on its review, the staff finds the applicant’s response to RAI 3.5.2-6 acceptable because the applicant explained that no analysis exist that meets the definition of TLAA in 10 CFR 54.3. The aging effects on materials due to corrosion are managed by the Containment Inservice Inspection (CII) and Containment Leak Rate programs. The staff’s concern described in RAI 3.5.2-6 is resolved.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.2 Water Control Structures Summary of Aging Management Evaluation – LRA Table 3.5.2-2

The staff reviewed LRA Table 3.5.2-2, which summarizes the results of AMR evaluations for the water control structures component groups.

The staff reviewed the information provided in LRA Table 3.5.2-2, and determined that the applicant has adequately identified applicable aging effects, and the AMPs credited for managing the aging effects for the JAFNPP Water Control Structures.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.3 Turbine Building Complex and Yard Structures Summary of Aging Management Evaluation – LRA Table 3.5.2-3

The staff reviewed the information provided in LRA Table 3.5.2-3, and determined that the applicant has adequately identified applicable aging effects, and the AMPs credited for

managing the aging effects for the JAFNPP Turbine Building Complex and Yard Structures.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.2.3.4 Bulk Commodities Summary of Aging Management Evaluation – LRA Table 3.5.2-4

The staff reviewed LRA Table 3.5.2-4, which summarizes the results of AMR evaluations for the bulk commodities component groups.

The staff reviewed the information provided in LRA Table 3.5.2-4, and determined that the applicant has adequately identified applicable aging effects, and the AMPs credited for managing the aging effects for the JAFNPP Bulk Commodities Component Groups.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.5.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the structures and component supports components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

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 instrumentation and controls components and component groups of the following:

- insulated cables and connections
- metal-enclosed bus
- transmission conductors
- switchyard bus
- high-voltage insulators
- 115kV oil-filled cable system

3.6.1 Summary of Technical Information in the Application

In LRA Section 3.6, the applicant provided AMR results for the electrical and instrumentation and controls components and component groups. In LRA Table 3.6.1, "Summary of Aging Management Programs for the Electrical and I&C Components," the applicant provided a

summary comparison of its AMRs with the AMRs evaluated in the GALL Report for the electrical and instrumentation and controls components and component groups.

The applicant's AMRs incorporated applicable operating experience in the determination of AERMs. These reviews included evaluation of plant-specific and industry operating experience. The plant-specific evaluation included reviews of condition reports and discussions with appropriate site personnel to identify AERMs. The applicant's review of industry operating experience included a review of the GALL Report and operating experience issues identified since the issuance of the GALL Report.

3.6.2 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 instrumentation and controls components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

The staff conducted an onsite audit of AMRs to confirm the applicant's claim that certain identified 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 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 that were consistent with the GALL Report and for which further evaluation is recommended. The staff confirmed that the applicant's further evaluations were consistent with the acceptance criteria in SRP-LR Section 3.6.2.2. The staff's audit evaluations are documented in SER Section 3.6.2.2.

In the onsite audit, the staff also conducted a technical review of the remaining AMRs that were not consistent with, or not addressed in, the GALL Report. The audit and technical review included evaluating whether all plausible aging effects were identified and whether the aging effects listed were appropriate for the combination of materials and environments specified. The staff's audit evaluations are documented in SER Section 3.6.2.3. The staff's evaluation of the technical review is also documented in SER Section 3.6.2.3.

Finally, the staff reviewed the AMP summary descriptions in the UFSAR supplement to ensure that they provided an adequate description of the programs credited with managing or monitoring aging for the electrical and instrumentation and controls components.

Table 3.6-1, provided below, includes a summary of the staff's evaluation of components, aging effects/mechanisms, and AMPs, listed in LRA Section 3.6, that are 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	AMP in LRA	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	TLAA	Consistent with GALL Report, which recommends further evaluation (See SER Section 3.6.2.2.1)
Electrical cables, connections and fuse holders (insulation) not subject to 10 CFR 50.49 EQ requirements (3.6.1-2)	Reduced insulation resistance and electrical failure due to various physical, thermal, radiolytic, photolytic, and chemical mechanisms	Electrical Cables and Connections Not Subject to 10 CFR 50.49 EQ Requirements	Non-EQ Insulated Cables and Connections Program (B.1.19)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
Conductor insulation for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR) (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	Non-EQ Instrumentation Circuits Test Review Program (B.1.18)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
Conductor insulation for inaccessible medium voltage (2 kV to 35 kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 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	None	Not consistent with GALL Report (See SER Section 3.6.2.3)
Connector contacts for electrical connectors exposed to borated water leakage (3.6.1-5)	Corrosion of connector contact surfaces due to intrusion of borated water	Boric Acid Corrosion	None	Not applicable to BWRs

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Fuse Holders (Not Part of a Larger Assembly): Fuse holders - metallic clamp (3.6.1-6)	Fatigue due to ohmic heating, thermal cycling, electrical transients, frequent manipulation, vibration, chemical contamination, corrosion, and oxidation	Fuse Holders	None	Not Consistent with GALL Report (See SER Section 3.6.2.3)
Metal enclosed bus - Bus/connections (3.6.1-7)	Loosening of bolted connections due to thermal cycling and ohmic heating	Metal Enclosed Bus	Metal-Enclosed Bus Inspection Program (B.1.17)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
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	Metal-Enclosed Bus Inspection Program (B.1.17)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
Metal enclosed bus - Enclosure assemblies (3.6.1-9)	Loss of material due to general corrosion	Structures Monitoring Program	Metal-Enclosed Bus Inspection Program (B.1.17)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
Metal enclosed bus - Enclosure assemblies (3.6.1-10)	Hardening and loss of strength due to elastomers degradation	Structures Monitoring Program	Metal-Enclosed Bus Inspection Program (B.1.17)	Consistent with GALL Report, which recommends no further evaluation (See SER Section 3.6.2.1)
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	None	Consistent with GALL Report for which further evaluation is recommended (See SER Section 3.6.2.2)

Component Group (GALL Report Item No.)	Aging Effect/ Mechanism	AMP in GALL Report	AMP in LRA	Staff Evaluation
Transmission conductors and connections; switchyard bus and connections (3.6.1-12)	Loss of material due to wind induced abrasion and fatigue; loss of conductor strength due to corrosion; increased resistance of connection due to oxidation or loss of preload	A plant-specific aging management program is to be evaluated	None	Consistent with GALL Report for which further evaluation is recommended (See SER Section 3.6.2.2)
Cable Connections - Metallic parts (3.6.1-13)	Loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Electrical Cable Connections Not Subject To 10 CFR 50.49 Environmental Qualification Requirements	None	Not consistent with GALL Report (See SER Section 3.6.3)
Fuse Holders (Not Part of a Larger Assembly) Insulation material (3.6.1-14)	None	None	None	Consistent with GALL Report

The staff's review of the electrical and instrumentation and controls component groups followed one of several approaches. One approach, documented in SER Section 3.6.2.1, discusses the staff's review of the AMR results for components that the applicant indicated are consistent with the GALL Report and do not require further evaluation. Another approach, documented in SER Section 3.6.2.2, discusses the staff's review of the 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, discusses the staff's review of the 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 that are credited to manage or monitor aging effects of the electrical and instrumentation and controls components is documented in SER Section 3.0.3.

3.6.2.1 AMR Results That Are Consistent with the GALL Report

Summary of Technical Information in the Application. In LRA Section 3.6.2.1, the applicant identified the materials, environments, and AERMs. The applicant identified the following programs that manage the effects of aging related to the electrical and instrumentation and controls components:

- External Surfaces Monitoring Program
- Metal-Enclosed Bus Inspection Program

- Non-EQ Instrumentation Circuits Test Review Program
- Non-EQ Insulated Cables and Connections Program
- Oil Analysis Program

In LRA Table 3.6.2-1, the applicant provided a summary of AMRs for the electrical and instrumentation and controls components and identified which AMRs it considered to be consistent with the GALL Report.

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL Report and for which the GALL Report does not recommend further evaluation, the staff performed an audit and review to determine whether the plant-specific components contained in these GALL Report component groups were bounded by the GALL Report evaluation.

The applicant provided a note for each AMR line item. The notes describe how the information in the tables aligns with the information in the GALL Report. The staff audited those AMRs with notes A through E, which indicate that 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report and the 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 AMP identified in the GALL Report. The staff audited these line items to verify consistency with the GALL Report. The staff verified that the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant is consistent with the AMP identified in the GALL Report 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 AMP identified by the GALL Report. This note indicates that the applicant was unable to find a listing of some system components in the GALL Report; however, the applicant identified a different component in the GALL Report that has the same material, environment, aging effect, and AMP as the component that was 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 AMP identified in the GALL Report. 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. The staff verified whether the identified exceptions to the GALL AMPs had been reviewed and accepted by the staff. The staff also determined whether the AMP identified by the applicant was consistent with the AMP

identified in the GALL Report 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 a different AMP is credited. The staff audited these line items to verify consistency with the GALL Report. The staff also determined whether the identified AMP would manage the aging effect consistent with the AMP identified in the GALL Report and whether the AMR was valid for the site-specific conditions.

The staff conducted an audit and review of the information provided in the LRA. The staff did not repeat its review of the matters described in the GALL Report; however, the staff did verify that the material presented in the LRA was applicable and that the applicant identified the appropriate GALL Report AMRs. The staff's evaluation is discussed below.

3.6.2.1.1 Loss of material due to general corrosion

In the discussion section of LRA Table 3.6.1, Item 3.6.1-9, the applicant stated that loss of material of metal enclosed bus enclosure assemblies is managed by the Metal-Enclosed Bus Inspection Program. The staff noted that in the AMR results line that points to Table 3.6.1, Item 3.6.1-9, the applicant included a reference to Note E.

The staff reviewed the AMR results line referenced to Note E and determined that the component type, material, environment, and aging effect are consistent with the corresponding line of the GALL Report; however, where the GALL Report recommends the AMP XI.S6, "Structures Monitoring Program," the applicant has proposed the Metal-Enclosed Bus Inspection Program.

As discussed in SER Section 3.0.3.2.13, the staff found the Metal-Enclosed Bus Inspection Program acceptable to inspect loss of material of metal enclosed bus enclosure assemblies due to corrosion. On this basis, the staff finds the AMR results for this line item acceptable.

3.6.2.1.2 Hardening and loss of strength due to elastomer degradation

In the discussion section of LRA Table 3.6.1, Item 3.6.1-10, the applicant stated that elastomer degradation of metal enclosed bus enclosure assemblies is managed by the Metal-Enclosed Bus Inspection Program. The staff noted that in the AMR results line that points to Table 3.6.1, Item 3.6.1-9, the applicant included a reference to Note E.

The staff reviewed the AMR results line referenced to Note E and determined that the component type, material, environment, and aging effect are consistent with the corresponding line of the GALL Report; however, where the GALL Report recommends the AMP XI.S6, "Structures Monitoring Program," the applicant has proposed the Metal-Enclosed Bus Inspection Program.

As discussed in SER Section 3.0.3.2.13, the staff found the Metal-Enclosed Bus Inspection Program acceptable to inspect the metal enclosed bus elastomer degradation.

The staff evaluated the applicant's claim of consistency with the GALL Report. The staff also reviewed information pertaining to the applicant's consideration of recent operating experience and proposals for managing the associated aging effects. On the basis of its review, the staff concludes that the AMR results, which the applicant claimed to be consistent with the GALL Report, are indeed consistent with the AMRs in the GALL Report. Therefore, the staff concludes

that the applicant has demonstrated that the effects of aging for these components will be adequately managed so that their intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.2.2 AMR Results That Are Consistent with the GALL Report, for Which Further Evaluation is Recommended

Summary of Technical Information in the Application. In LRA Section 3.6.2.2, the applicant provided further evaluation of aging management, as recommended by the GALL Report, for the electrical and instrumentation and controls components. The applicant provided information concerning how it will manage the following aging effects:

- electrical equipment subject to EQ
- degradation of insulator quality due to presence of any salt deposits and surface contamination, and loss of material due to mechanical wear
- loss of material due to wind induced abrasion and fatigue, loss of conductor strength due to corrosion, an increased resistance of connection due to oxidation or loss of pre-load
- QA for aging management of nonsafety-related components

Staff Evaluation. For component groups evaluated in the GALL Report, for which the applicant claimed consistency with the GALL 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 3.6.2.2. The staff's evaluation of the aging effects is discussed in the following sections.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

The staff reviewed LRA Section 3.6.2.2.1 against the criteria in SRP-LR Section 3.6.2.2.1.

In LRA Section 3.6.2.2.1, the applicant stated that environmental qualification is a TLAA, as defined in 10 CFR 54.3.

SRP-LR Section 3.6.2.2.1 states that the applicants are required to evaluate TLAAs in accordance with 10 CFR 54.21(c)(1). The evaluation of the TLAA is addressed in SRP-LR Section 4.4.

SER Section 4.4 documents the staff's review of the applicant's evaluation of this TLAA. Based on the review, staff concludes that the applicant has met the criteria of SRP-LR Section 3.6.2.2.1.

3.6.2.2.2 Degradation of Insulator Quality Due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material Due to Mechanical Wear

The staff reviewed LRA Section 3.6.2.2.2 against the criteria in SRP-LR Section 3.6.2.2.2.

In LRA Section 3.6.2.2.2, the applicant addressed degradation of insulator quality due to presence of salt deposits and surface contamination, and loss of material due to mechanical

wear. The applicant stated, in the LRA, that the insulators evaluated for JAFNPP license renewal are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses. 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. JAFNPP is not located near the seacoast or near other sources of airborne particles. The applicant, therefore, concludes that surface contamination is not an applicable aging effect for high-voltage insulators at JAFNPP.

The applicant also stated in the LRA that mechanical wear is an aging effect for strain and suspension insulators subject to movement. Although this mechanism is possible, industry experience has shown transmission conductors do not normally swing and when subjected to a substantial wind, movement will subside after a short period. Wear has not been apparent during routine inspection and is not a credible aging effect.

SRP-LR Section 3.6.2.2.2 states that degradation of insulator quality due to presence of any salt deposits and surface contamination could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP for plants location such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution). Loss of material due to mechanical wear caused by wind blowing on transmission conductors could occur in high-voltage insulators. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

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 JAFNPP is not located near facilities that discharge soot or near the sea coast, the staff found that surface contamination is not an applicable aging effect requiring management for high-voltage insulators at JAFNPP.

Mechanical wear could be an aging effect for strain and suspension insulators in that 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 the mechanical wear is possible, experience has shown that transmission conductors do not normally swing and even when they do, due to a substantial wind, do not continue to swing for long once the wind has subsided. Because transmission conductors do not frequently swing and even when they do, due to substantial wind, do not continue to swing for a long when the wind has subside, the staff found that the mechanical wear is not an applicable aging effect that can cause a loss of intended function of the insulators at JAFNPP. Therefore, an AMP for high-voltage insulators is not required.

Based on the technical justification identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.6.2.2.2. 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 the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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, an Increased Resistance of Connection Due to Oxidation or Loss of Pre-Load

The staff reviewed LRA Section 3.6.2.2.3 against the criteria in SRP-LR Section 3.6.2.2.3.

In LRA Section 3.6.2.2.3, the applicant addressed loss of material due to wind induced abrasion and fatigue, loss of conductor strength due to corrosion of transmission conductors, and increased resistance of connections due to oxidation or loss of pre-load of transmission connections, and in switchyard bus connections. The applicant stated, in the LRA, that transmission conductors are uninsulated, stranded electrical cables used outside building in high-voltage applications. The transmission conductor commodity group includes the associated fastening hardware, but excludes the high-voltage insulators. Major active equipment assemblies include their associated transmission conductor terminations.

The applicant also stated that transmission conductors are subject to AMR if they are necessary for recovery of offsite power following an SBO. At JAFNPP, transmission conductors located between the switchyard breaker and reserve station service transformer (RSST) T3 support recovery from an SBO event. Other transmission conductors are not subject to AMR since they do not perform a license renewal intended function. For potential loss of conductor strength due to corrosion, the applicant stated in the LRA that the most prevalent mechanism contributing 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. There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. Corrosion rate depends largely on air quality. Corrosion of ACSR conductors is a very slow-acting aging effect that is even slower for rural areas with generally less suspended particle and SO_2 concentration in the air than urban areas.

For the potential loss of material due to wind induced abrasion of transmission conductors, the applicant, in the LRA, stated that wind loading can cause transmission conductor vibration, or sway. Consideration of wind loading is during the design and installation phase. Loss of material that could be caused by transmission vibration or sway are not applicable aging effects in that they would not cause a loss of intended function if left unmanaged for the extended of operation.

For the potential increased resistance of connection due to oxidation or loss of pre-load of transmission and transmission connection, switchyard bus, and switchyard bus connections, the applicant, in the LRA, states that the switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium and high-voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switch, switchyard breakers, and transformers. Switchyard bus located at the switchyard breakers and at RSST T2 and T3 that support recovery from an SBO event are

subject to aging management review. Other switchyard bus does not require AMR since they do not perform a license renewal intended function. Connections surface oxidation for aluminum switchyard bus is not applicable since switchyard bus connections requiring AMR are welded connections. For ambient environmental condition at JAFNPP, no aging effects have been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible connectors connect switchyard bus. Therefore, the applicant concludes no aging effects requiring management for the switchyard bus.

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 could occur in transmission conductors and connections, and in switchyard bus and connections. The GALL Report recommends further evaluation of a plant-specific AMP to ensure that this aging effect is adequately managed.

The staff requested the applicant to explain why loss of conductor strength due to corrosion is not an aging effect requiring management for transmission conductors at JAFNPP. The staff also requested the applicant to include any test data to support applicant's response. In its response, the applicant stated that:

> Test performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80 year old ACSR conductor due to corrosion. RSST 71T-3 is connected to the 115kV switchyard with overhead transmission lines. The overhead transmission conductors are 336.4 MCM ACRS 18/1 conductors with a 7AWG static wire. This specific conductor type was bounded by the type of Ontario Hydroelectric tests. There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. As illustrated below, there is ample strength margin to maintain the transmission conductor intended function through the period of extended operation.
>
> The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind and temperature. These requirements are reviewed concerning the specific conductors included in the AMR. The strength margin (4/0 ACRS) will be used as an illustration.
>
> The ultimate strength and the NESC heavy load tension requirement of 4/0 (212 MCM) ACSR are 8350 lbs. and 2761 lbs., respectively. The margin between the NESC heavy load and the ultimate strength is 5589 lbs., there is a 67% of ultimate strength margin. The Ontario Hydroelectric study showed a 30% loss of composite conductor strength in an 80 year old conductor. In the case of the 4/0 ACSR transmission conductor, a 30% loss of ultimate strength would mean that there would still be a 37% ultimate strength margin between that is required by the NESC and the actual conductor strength.
>
> The 4/0 ACSR conductors have the lowest initial design margin of transmission conductors included in the AMR. This illustrates with reasonable assurance that

> transmission conductors will have ample strength through the period of extended operation. There are no applicable aging effects that could cause a loss of intended function of the transmission conductors for the period of extended operation.

The staff found the applicant's response acceptable because corrosion of ACSR conductor is a very slow acting mechanism and test data from Ontario Hydroelectric, which is bounded by the types of conductors at JAFNPP, 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 JAFNPP.

In LRA, Section 3.6.2.2.3, the applicant states that "loss of material that could be caused by transmission conductor vibration or sway are found not to be applicable aging effects in that they would not cause a loss of intended function if left unmanaged for the extended period of operation." The staff requested the applicant to explain why transmission conductor vibration or sway would not cause a loss of intended function. The applicant responded that:

> Transmission conductor vibration, or sway, would be caused by wind loading. Wind loading that can cause a transmission line and insulator to vibrate is considered in the design and installation. Loss of material (wear) and fatigue that could be caused by transmission conductor or sway are found not be applicable aging effects in that they would not cause a loss of intended function if left unmanaged for the period of extended operation. A review of industry OE and NRC generic communications related to the aging of transmission conductors ensured that no additional aging effects exist beyond those previously identified. A review of plant-specific OE did not identify any unique aging effects for transmission conductors.

The staff found the applicant's response acceptable because wind loading that can cause a transmission line and insulator to vibrate is considered in the design and installation. In addition, the applicant confirmed that no OE or staff's generic communication related to loss of material of transmission conductors due to vibration or sway was identified. Therefore, the staff found that loss of material caused by transmission conductor vibration or sway is not an applicable aging effect requiring management.

In the LRA, the applicant stated that no aging effects requiring management and no AMP is required for switchyard bus and connections. SRP, Section 3.8.2.2.3 identifies loss of preload is an potential aging effects for switchyard bus connections. In addition, EPRI document Technical Report TR-104213, "Bolted Joint Maintenance & Application Guide," recommends inspection of bolted joints for evidence of overheating, signs of burning or discoloration, and indication of loose bolted connections. The staff requested the applicant to provide a discussion why torque relaxation or surface oxidation for bolted connections of switchyard bus is not a concern at Fitzpatrick. The applicant responded that:

> Connection surface oxidation and loosening of bolted connections for aluminum switchyard bus is not applicable since the switchyard bus connections requiring AMR are welded connections. However, the flexible conductors, which are welded to the switchyard bus, are bolted to the other switchyard components. These switchyard component connections are also included in the infrared preventive

> maintenance of the 115kV switchyard, which verifies the effectiveness of the connection design and installation practices. The infrared PM is performed at least once every year. These flexible conductors were not considered part of the switchyard bus in the application, but these flexible conductors will be added to the switchyard bus commodity for completeness. These flexible conductor bolted connections are assembled similar to the transmission conductor bolted connection. These connections are also included in the annual infrared inspection of the 115 kV switchyard, which verifies the effectiveness of the connection design and installation practices. For environmental condition at JAFNPP, no significant aging has been identified that could cause a loss of intended function for the period of extended operation. Vibration is not applicable since flexible conductors connect to active components. Although not specifically stated, the switchyard connection requiring AMR are welded and bolted connections. Neither of these connections types require aging management, because the loosening of bolted connections is not a significant aging effect.

The staff found the applicant's response acceptable because heat created by increased resistance of switchyard bus connections due to corrosion or bolt loosening will be detected using the annual infrared PM. This PM will maintain the integrity of switchyard bus connections.

The staff also requested the applicant to provide a discussion why torque relaxation and surface oxidation of bolted connection of transmission conductors are not a concern for Fitzpatrick. The applicant responded that:

> Torque relaxation is not a significant aging effect for transmission connections. The design of the transmission conductor bolted connection preclude torque relaxation, and the plant specific OE supports this statement. The OE report did not identify any failures of switchyard connection due to aging. The typical design of switchyard bolted connections includes Bellville washers and is no-ox coated. The type of bolting plate and the use of Bellville washers is the industry standard to preclude torque relaxation. This combined with the proper sizing of the conductors virtually eliminate the need to consider this aging mechanism, therefore, there will be no significant aging.
>
> The transmission conductors within the scope of license renewal at JAFNPP are limited to the connections from the 115kV switchyard to the station service transformer for the SBO recovery path. JAFNPP performs infrared inspection of the 115 kV switchyard connections as part of a PM that is performed at least once per year. This PM and the absence of plant OE confirms that non significant aging is occurring for JAFNPP. Based on this information, torque relaxation of transmission connections does not require aging management for JAFNPP.
>
> Loss of material due to corrosion of connections due to surface oxidation is an applicable aging mechanism, but is not significant enough to cause a loss of intended function. The components in the switchyard are exposed to precipitation, but these component do not experience any appreciable aging effects in this environment, except for minor oxidation, which does not impact the ability of the connection to perform their intended function. At JAFNPP, switchyard connection

surface are coated with an anti-oxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from emerging the connections thus reducing the chances of corrosion. Based on the operating experience, the method of installation has been shown to provide a corrosion resistant low electrical resistance connection. In addition, the infrared inspection of the 115 kV switchyard verifies that this aging effect is not significant for JAFNPP. Therefore, it is concluded that general corrosion resulting from oxidation of switchyard connection surface metals does not require management at JAFNPP.

The staff found the applicant's response acceptable because the design of transmission connections using Bellville washers will eliminate the potential torque relaxation of bolted connections. Anti-oxidant compound will prevent the formation of oxides on the metal surface and to prevent moisture entering the connections thus reducing the chances of corrosion. In addition, routine infrared PM is performed at least annually to detect heat created by high resistance due to corrosion or bolted loosening and to verify the integrity of switchyard connections.

Based on the technical justification identified above, the staff concludes that the applicant has met the criteria of SRP-LR Section 3.6.2.2.3. For those line items that apply to LRA Section 3.6.2.2.3, the staff determines that the LRA is consistent with the GALL Report and the applicant has demonstrated that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB 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 provides the staff's evaluation of the applicant's QA program.

3.6.2.3 AMR Results That Are Not Consistent with or Not Addressed in the GALL Report

Summary of Technical Information in the Application. In LRA Table 3.6.2-1, the staff reviewed additional details concerning the results of the AMRs for material, environment, AERM, and AMP combinations that are not consistent with the GALL Report, or that are 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 concerning how the aging effects will be managed. Specifically, note F indicates that the material for the AMR line item component is not evaluated in the GALL Report. Note G indicates that the environment for the AMR line item component and material is not evaluated in the GALL Report. Note H indicates that the aging effect for the AMR line item component, material, and environment combination is not evaluated in the GALL Report. Note I indicates that the aging effect identified in the GALL Report for the line item component, material, and environment combination is not applicable. Note J indicates that neither the component nor the material and environment combination for the line item is evaluated in the GALL Report.

Staff Evaluation. For component type, material, and environment combinations that are not evaluated in the GALL Report, the staff reviewed the applicant's evaluation to determine whether the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation. The staff's evaluation is discussed in the following sections.

3.6.2.3.1 Electrical Components Summary of Aging Management Evaluation - LRA Table 3.6.1

In LRA Table 3.6.1, Item 3.6.1-6 discussion column, 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 is not applicable to JAFNPP because a review of JAFNPP documents indicates that fuse holders using metallic clamps are either part of an active device or located in circuits that perform no intended function. Therefore, the applicant states that fuse holders with metallic clamps at JAFNPP are not subject to aging management review at JAFNPP.

On the basis that fuse holders are either part of an active assembly or located in circuits that perform no license renewal intended function, the staff finds that an AMR is not required for fuse holders (insulation and metallic parts) at JAFNPP. The staff also finds that for this component type, the aging effect is not applicable to JAFNPP.

In LRA Table 3.6.1-4, the applicant states that aging effects defined in GALL Report are not applicable to the inaccessible medium-voltage cables which are not subject to 10 CFR 50.49 EQ requirements. The staff requested the applicant, in a letter dated November 7, 2006, to provide the detail explanation of how the review was conducted and the criteria used to determine that JAFNPP has no inaccessible medium-voltage cables requiring aging management and a list of cables considered for the review. In this letter, the staff also requested the applicant to identify if medium-voltage cable safety-related cable such as residual heat removal service water pump is inaccessible and provide a technical justification of why an AMP is not required.

In its response dated December 6, 2006, the applicant states that:

> The cables that are susceptible to water treeing are those exposed to significant moisture and subject to significant voltage (energized at least 25% of the time at 2kV to 35kV). In Section 2.5 of the LRA, inaccessible medium-voltage cables were excluded from AMR based on the statement "JAFNPP does not have any inaccessible underground medium-voltage cables that perform a license renewal intended function."
>
> The method used for identifying medium-voltage cables was to review the electrical cable and raceway information system for all "H" level cables. At JAFNPP, the "H" designation is for 2kV to 35kV insulated cables. A review of JAFNPP drawings and cable information system identified inaccessible medium voltage cables. The medium-voltage cables were then screened for exposure to moisture (was the routing underground), and type of service (was the cable energized greater than 25% of the time). The core spray pump motor cables and the residual heat removal pump motor cables are the only inaccessible

medium-voltage cables that have a license renewal intended function, are potentially exposed to moisture, and are energized greater than 25% of the time. These cables are in the EQ program and therefore, are replaced based on qualified life and are not subject to an AMR. JAFNPP has no non-EQ inaccessible medium-voltage cables that support an intended function.

The RHR service water pump motor cable are not exposed to moisture; therefore, they were screened out. As stated in previously, the only cables that met the criteria for inaccessible medium-voltage cables are subject to 10 CFR 50.49 EQ requirements. EQ cables are replaced based on qualified life, therefore, in accordance with 10 CFR 54.21(a)(1)(ii), they are not subject to AMR.

The staff noted that cables within the scope of license renewal have to be non-EQ, medium-voltage (2kV to 35kV), and are subjected to significant moisture (installed in duct banks, cable trench underground) and significant voltage (energized more than 25% of the time) to be included in GALL AMP XI.E3 program. Because JAFNPP does not have any non-EQ inaccessible medium-voltage cables that support a license renewal intended function, the staff finds that aging effects for inaccessible medium-voltage cables identified in GALL Report are not applicable to JAFNPP.

3.6.2.3.2 Electrical Components Summary of Aging Management Evaluation – LRA Table 3.6.2-1

The staff reviewed LRA Table 3.6.2-1, which summarizes the results of AMR evaluations for the electrical components.

In LRA, Table 3.6.2-1, under Cable Connections, under Note I, the applicant states that aging effect in GALL Report for this component, materia, and environment combination is not applicable. Table 3.6.1, Item 3.6.1-13 discussion column, the applicant states that the loosening of bolting connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation of the metallic parts of cable connections is not applicable to JAFNPP because cable connections outside of active devices are taped or sleeved for protection. Operating experience with metallic of electrical cable connections at JAFNPP indicated no aging effects requiring management.

The staff noted that electrical cable connections are subject to the thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation aging stressors. GALL Report, Revision 1, AMP XI.E6, "Electrical Cable Connection not Subject to 10 CFR 50.49 Environmental Qualification Requirements," specifies that connections associated with cables within the scope of license renewal are part of this program, regardless of their association with active or passive components. The staff requested that the applicant provide a justification for why an AMP is not necessary or provide an AMP with the ten elements for cable connections. In its response, the applicant stated that:

The LR project identifies connections to include in the AMP by evaluating the JAFNPP non-EQ cable connections that meet the criteria of being a bolted connection. Switchyard connections are not addressed in this program, since these connections operate at a much higher voltage (> 35kV); they are addressed

separately as part of the switchyard commodity types.

Connection for all voltage levels are considered in scope. The stressors thermal cycling, ohmic heating, and electrical transients are potential stressors only for high load connections.

Thermal cycling, ohmic heating, and electrical transients are not potential stressors for low-load connections. Low-load connections located in a controlled environment can be screened out, because vibration, chemical contamination, corrosion and oxidation are not a concern. Low-load field instrumentation connections within the scope of license renewal such as pressure transmitters, resistant temperature detectors (RTDs), and flow transmitters are not subject to an AMR, because the instrumentation within the scope of license renewal located in a harsh environment, are typically EQ, the non-EQ sensitive instrument circuit (high radiation and neutron monitoring) connections which are included in GALL AMP XI.E2 program. All connections associated with circuits that do not an intended function, such as general lighting, are not subject to an AMR.

The types of circuits considered for identifying cable connections are electrical and instrumentation and controls (I&C) penetrations, DC load centers, inverters, battery chargers, motors, motor control centers (MCCs), switchgear, circuit breakers, transformers, metal-enclosed bus, and field components. All of the electrical and I&C penetration are EQ; therefore, all of the connection for these penetrations were excluded. The field components considered include current/potential transformers (CTs/PTs), and power supplies. The assumption made for the non-EQ high load connections was that all of these connections are bolted.

The basis discusses the stressors that are being addressed. Plant information (single line drawing, switchyard drawing) was searched t determine the potential population of bolted connections. The criterion used for determining the high load connections was identifying powers circuits for all voltage levels. The types of cable connections that were determined to meet the definition of a high load connection are subject to an AMR.

In addition to the proposed one-time inspection program, many of the JAFNPP cable connections are inspected or tested by preventive maintenance (PM) for the following components were searched to determine if the PM evaluated the field cable connections associated with the active components.

- 480 VAC MCCs and Switchgear (MP-056.01 AC Motor Control Center Maintenance)
- 600 VAC MCCs and Switchgear (MP-056.01 AC Motor Control Center Maintenance)
- 4160 VAC Switchgear (MP-054.02 4.16kV Bus and Metal-Clad Switchgear)

- AC Motors(MP-059.83 Motor Power Monitoring (MPM) Testing and Analysis)
- DC Motors (MP-059.83 MPM Testing Analysis)
- 125 VDC Distribution and Lighting Panels (MP.200.16 Maintenance and Subcomponent Replacement of GE 7700 Series DC Motor Control Centers)
- Battery Control Board (MP.200.16 Maintenance and Subcomponent Replacement of GE 7700 Series DC Motor Control Centers)
- 125 VDC MCCs (MP.200.16 Maintenance and Subcomponent Replacement of GE 7700 Series DC Motor Control Centers)
- Battery Chargers
- Reserve Transformers (MP-071.42 Station Service Transformer Maintenance)

The maintenance procedures for these component types have details to detect degradation of bolted connections.

The maintenance rule indicators for the systems that contain these commodities do not show problems or issues that have not been resolved. There is no plant OE that identified degraded connections where the degradation was a result of aging.

JAFNPP will have a one-time inspection program that will inspect or test a representative sample of the connection types. The one-time inspection program will verify that there no aging effects that require management during the period of extended operation.

The applicant also stated that the scope of program will include non-EQ connections associated with cables within the scope of license renewal are included in this program. The program does not include the higher voltage (> 35 kV) switchyard connections. The connections within the scope of license renewal are screened for applicability of this program. This program will focus on the metallic parts of the cable connections. The one-time inspection verifies that the loosening of bolted connections due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation do not require a periodic aging management program. A representative sample of the electrical cable connection population subject to an AMR will be inspected and tested. The sample will include each type of electrical cable connection. The following factors will be considered for sampling: voltage level (medium and low voltage), circuit loading (high load), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected will be documented. This is listed as the Commitment No. 24.

Pending the review of the applicant's one-time inspection program as discussed above and the LRA supplement, the staff found the applicant’s response acceptable. Many of the JAFNPP cable connections are inspected or tested by periodic preventive maintenance. The staff reviewed a sample of these procedures and confirmed that the cable connections associated with active components are inspected or monitored. For low load connections located in a controlled environment (etc, control room), vibration, chemical contamination, corrosion and oxidation are

not a concern because the above aging effects are not significant. These cable connections can be screened out. High voltage connections (> 35 kV) are installed in the switchyard and these connections are addressed in SER Section 3.6.2.2. For cable connections that are not covered by a preventive maintenance or are not located in a controlled environments, the applicant will have a one-time inspection that will inspect or test a representative sample of the connection types. The staff also found the one-time inspection acceptable because no plant operating experience has identified degraded connections where the degradation was a result of aging. A representative sample of electrical connection population subject to AMR will be inspected and tested. The applicant will consider the following factors for sampling: voltage level (medium and low voltage), circuit loading (high load), and location (high temperature, high humidity, vibration, etc.). The technical basis for the sample selected will be documented.

In its letter dated February 1, 2007, the applicant added LRA Sections A.2.1.40 and B.1.34 describing its Bolted Cable Connections Program. It also amended Section 3.6.2.1, Aging Effects Requiring Management, Section 3.6.2.1, Aging Management Program, Table 3.6.1, and Table 3.6.2-1. The applicant also included the plant-specific program elements for Bolted Cable Connections Program. The staff's evaluation of the applicant's Bolted Cable Connections Program is documented in SER Section 3.0.3.3.6.

In LRA Table 3.6.2-1, under oil filled cable system, the applicant indicated via footnote J for material, environment, aging effects and aging management program. Footnote J is neither the component nor the material and environment combination evaluated in GALL report. The applicant also stated that 115kV oil-filled cables (passive electrical for station blackout) has no aging effect requiring management for meeting the component's electrical intended function.

In RAI 3.6.2-1 dated November 7, 2006, the staff requested that the applicant provide a technical justification of why an AMP is not required or provide a plant-specific AMP that contains the required ten elements to manage the aging effects due to aging mechanism such as paper insulation degradation, moisture intrusion, elevated temperature, and galvanic corrosion. In addition, the staff also requested the applicant to explain what periodic tests are planned prior to and during the period of extended operation.

In its response dated April 6, 2007, the applicant stated that:

> The JAFNPP AMR determined there were no aging effects requiring management for the oil-filled cables for the "provide electrical connection" function.
>
> The underground oil-filled cable environment is constant temperature soil, ambient temperature, and moisture. The underground oil-filled cables are 350 MCM hollow core copper, oil with impregnated/copper wall/intercalated with paper tape/copper bearing lead wall and a polyethylene jacket. The underground oil-filled cables use a lead sheath to prevent effects of moisture on the cables. This cable is designed with a thick layer of lead over the cable insulation and an overall jacket over the lead and insulation. Lead sheath cables are designed for submergence for extended operation.
>
> Operating experience was reviewed by searching JAF condition reports and interviewing knowledgeable plant staff. No failures were identified. This is consistent with the industry operating experience for this type of cable system.

> The mechanism/stressor identified in this question are not an issue for this type of cable. A lead-sheathed cable is not susceptible to moisture intrusion. There are no environment issues associated with degradation of the paper insulation. This is supported by plant and industry OE. Elevated operating temperature is not an issue since the cables are designed for the load and do not operate in an area of elevated temperature. There are no dissimilar metal connections, so galvanic corrosion is not an issue. Since the cable is lead-sheathed, the insulation material is protected from moisture.

The staff disagreed with the applicant's conclusion that there were no aging effects requiring management for the oil-filled cables. The staff determined that degradation of oil-filled cable system in a contaminated oil environment is a concern that needs to be addressed during the period of extended operation. Based on the staff's review of vendor manual and discussions with the cable manufacturer, the staff determined that a positive oil pressure must be maintained in the cable system at all times to prevent any moisture intrusion. This is needed to ensure that the dielectric property of the oil in the cable system can be maintained to the manufacturer's specifications. The oil-filled cable system must also be inspected for oil leaks and the oil samples should be tested in accordance with industry standards. To address the staff's concern, the applicant revised its aging management evaluations in a letter dated April 6, 2007. The applicant stated that:

> LRA Section 3.6.2.1, Oil-Filled Cable System, will be added as follows:
>
> Oil-Filled Cable System
>
> The reserve station service transformer (T2) high side connects to the 115kV switchyard breaker (10022) via an underground low-pressure oil-filled cable.
>
> The mechanical portion, oil-filled cable system components provide a reservoir of oil for the cables with a high/low alarm. The mechanical portion has an intended function of pressure boundary, which is subject to aging management review.
>
> The electrical portion of the oil-filled cable system consists of a single 350MCM cable per phase plus a spare cable. The 115kV underground low-pressure oil-filled transmission cables are in the offsite-power recovery path and are subject to aging management review.
>
> 115kV Oil-Filled Cables (electrical)
>
> The reserve station service transformer (T2) high side connects to the 115kV switchyard breaker (10022) via an underground low-pressure oil-filled cable.
>
> The underground oil-filled transmission cable consists of a single 350MCM cable per phase plus a spare cable. The spare cable is to ensure reliability is maintained should there be a single cable failure. Cable construction has a spiral steel core as a central helix preventing cable collapse and serves as the channel for the cable-oil. Copper conductors are shaped over the spiral steel core. The copper conductors are wrapped with paper insulation then completely immersed and impregnated with insulating oil under pressure. A seamless lead sheath is applied

to the impregnated paper, which prevents moisture intrusion into the cable insulation and retains the oil. As an anti-corrosion protection, the cable uses an okolene (black polyethylene) outer jacket over the lead sheath. Lead sheath cables are designed for installation in wet environments for extended periods.

The JAF oil-filled cable system will be included in the periodic surveillance and preventive maintenance program to verify the absence of aging effects that require management.

Underground Low-Pressure Oil-Filled Cable System (Mechanical)

The oil-filled cable system consists of carbon steel tanks, stainless steel cell banks, sight glasses, copper alloy and stainless steel valve bodies, and stainless steel tubing with an intended function of pressure boundary.

The cell banks, tanks, sight glasses, valve bodies, and tubing environments are oil internal and outdoor air external.

Aging Effects for Mechanical Components

Aging effects for materials exposed to oil:

MATERIAL	AGING EFFECT	AGING MECHANISM
Carbon Steel (internal surfaces)	Loss of Material	General corrosion Galvanic corrosion Crevice corrosion Microbiologically influenced corrosion (MIC) Pitting Corrosion
Stainless Steel (internal surfaces)	Loss of Material	Crevice corrosion Microbiologically influenced corrosion (MIC) Pitting Corrosion
Copper Alloy (internal surfaces)	Loss of Material	Crevice corrosion Microbiologically influenced corrosion (MIC) Pitting Corrosion Selective leaching

Aging effects for materials exposed to air-outdoor:

MATERIAL	AGING EFFECT	AGING MECHANISM
Carbon Steel (external)	Loss of Material	General corrosion Crevice corrosion

		Pitting Corrosion
Stainless Steel (external)	Loss of Material	Crevice corrosion Pitting Corrosion
Copper Alloy (external)	Loss of Material	Crevice corrosion Pitting Corrosion

<u>Aging Effects for Electrical Components</u>

Loosening of bolted connections

Aging Effects Requiring Management

Loss of material from internal and external surfaces of carbon steel, stainless steel and copper alloy components is an aging effect requiring management. The Oil analysis program and External surfaces monitoring program in conjunction will be implemented by JAFNPP to manage aging effects for the mechanical portion oil-filled cable system.

Operating Experience Review

The operating experience review at JAFNPP did not identify any failures of the oil-filled cable system, but because of the uniqueness of this system, an additional search was performed for the oil filled cable. Additional operating experience was reviewed by searching the JAF CR database, and the INPO database for additional keywords “oil-filled,” “cable failure,” “underground cable,” and “115kV.” No failures were identified for the oil-filled cable. Interviews with knowledgeable plant staff did not identify any additional OE.

JAFNPP Aging Management Programs

The Oil Analysis Program, External Surfaces Monitoring Program, and Periodic Surveillance and Preventive Maintenance Program in combination will manage the effects of aging, thereby precluding loss of the intended functions of the oil-filled cable system.

Oil Analysis Program

The Oil Analysis Program will manage the mechanical portion of the low-pressure oil-filled cable system maintaining the oil systems free of contaminants (primarily water and particulates) thereby preserving an environment that is not conducive to aging mechanisms. This program manages loss of material for carbon steel, stainless steel, and copper alloy components wetted by oil. Also, this program will test the insulating oil contained in the electrical cable portion of the system. Insulating oil testing will be performed based on testing criteria and acceptance criteria in accordance with Doble: Reference Book on Insulating Liquids and Gasses, Doble Engineering company.

External Surfaces Monitoring

Under the External Surfaces Monitoring Program, visual inspections manage aging effects for the external surfaces of the mechanical portion of the low-pressure oil filled cable system. The program manages loss of material for external carbon steel, stainless steel, and copper alloy components by visual inspection of external surfaces.

Periodic Surveillance and Preventive Maintenance Program

The following activities, under the Periodic Surveillance and Preventive Maintenance Program for the 115kV underground oil-filled cables will verify the absence of aging effects requiring management. A preventive maintenance procedure will provide the maintenance activities for the oil-filled cable system as described in the vendor maintenance requirements. This program will ensure that the oil-filled cable system will be able to perform its intended function into the period of extended operation.

Weekly operational inspections are performed on the115kV yard readings to check oil level in the reservoirs. Each reservoir is equipped with an external sight-glass and a level switch to provide high and low-level alarms. This assures positive pressure and purity of the oil to assure there are no voids.

Visual inspection will be performed to:

- Check all exposed parts of the cable, potheads and reservoirs for physical damage
- Check seams, valves, soldered joints and lead wipes for evidence of oil leaks
- Check oil level in the reservoir against previous level.

These visual inspections meet the vendor recommendations and will be performed at least once per year.

A PM will be performed to check the oil level alarm switch settings in accordance with the vendor manual. This PM will be performed at least once every year.

During maintenance inspections on circuit breakers and transformers, the following will be performed:

- Check the torque of the pothead bolts as specified in the vendor manual.

The frequency of this maintenance will be at least once every five years.

The applicant also revised LRA Table 3.6.2-1 to reflect its AMR evaluations.

Loss of material from internal and external surface of carbon steel, stainless steel and copper

alloy components in oil-filled cable system is an aging effect requiring management. The Oil Analysis Program, External Surfaces Monitoring Program, and Periodic Surveillance and Preventive Maintenance Program in combination will be implemented by the applicant to manage aging effects for the oil-filled cable system. The staff's evaluation of these programs show that it adequately manages the aging effect identified by the applicant. The staff's evaluation of Oil Analysis Program, External Surface Monitoring Program, and Periodic Surveillance and Preventive Maintenance Program are discussed in SER Sections 3.0.3.2.14, 3.0.3.2.9, and 3.0.3.3.4, respectively. In its response dated April 6, 2007, the applicant committed to implement the Oil-Filled Cable System aging management that will be controlled by the External Surfaces Monitoring Program, Oil Analysis Program, and Periodic Surveillance and Preventive Maintenance Program before the period of extended operation (Commitment No. 25 (JAFP-07-0048, dated April 6, 2007)).

The staff finds the applicant's response to RAI 3.6.2-1 acceptable because the actions discussed above are acceptable to manage aging effects of oil-filled cable system. The staff's concern described in RAI 3.6.2-1 is resolved.

On the basis of its review, the staff finds that the applicant appropriately evaluated the AMR results involving material, environment, AERMs, and AMP combinations that are not evaluated in the GALL Report. The staff finds that the applicant has demonstrated that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.6.3 Conclusion

The staff concludes that the applicant has provided sufficient information to demonstrate that the effects of aging for the electrical and instrumentation and controls components, that are within the scope of license renewal and subject to an AMR, will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3).

3.7 Conclusion for Aging Management Review Results

The staff reviewed the information in LRA Section 3, "Aging Management Review Results," and LRA Appendix B, "Aging Management Programs and Activities." On the basis of its review of the AMR results and AMPs, the staff concludes, that the applicant has demonstrated that the aging effects will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation, as required by 10 CFR 54.21(a)(3). The staff also reviewed the applicable UFSAR supplement program summaries and concludes that the supplement adequately describes the AMPs credited for managing aging, as required by 10 CFR 54.21(d).

With regard to these matters, the staff concludes that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and any changes made to the CLB, in order to comply with 10 CFR 54.21(a)(3), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

SECTION 4

TIME-LIMITED AGING ANALYSES

4.1 Identification of Time-Limited Aging Analyses

This section of the safety evaluation report (SER) addresses the identification of time-limited aging analyses (TLAAs). In license renewal application (LRA) Sections 4.2 through 4.7, Entergy Nuclear Operations, Inc. (ENO or the applicant) addressed the TLAAs for James A. FitzPatrick Nuclear Power Plant (JAFNPP). 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 its calculations and analyses against the six criteria specified in 10 CFR 54.3. The applicant indicated that it had searched the current licensing basis (CLB) for calculations meeting the six criteria. The CLB includes the updated final safety analysis report (UFSAR), engineering calculations, technical reports, engineering work requests, licensing correspondence, and applicable vendor reports. LRA Table 4.1-1, "List of JAFNPP TLAA and Resolution," lists the applicable TLAAs:

- reactor vessel neutron embrittlement analyses
- metal fatigue analyses
- environmental qualification analyses of electrical equipment
- concrete containment tendon prestress analyses
- containment liner plate, metal containment, and penetrations fatigue analyses
- recirculation valves fatigue evaluation
- leak-before-break
- BWRVIP-05, reactor pressure vessel (RPV) circumferential welds analysis
- BWRVIP-25, core plate
- BWRVIP-38, shroud support fatigue analysis
- BWRVIP-47-A, lower plenum fatigue analysis
- BWRVIP-74, reactor vessel
- BWRVIP-76, core shroud fatigue analysis

Pursuant to 10 CFR 54.21(c)(2), the applicant stated that it did not identify exemptions granted under 10 CFR 50.12 based on a TLAA as defined in 10 CFR 54.3.

4.1.2 Staff Evaluation

LRA Section 4.1 lists the JAFNPP 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 listed common TLAAs from 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 JAFNPP in LRA Table 4.1-1.

The staff reviewed information in Table 4.1-1. The staff also reviewed related Class 1 components in Table 3.1.2-1. Generally, a metal fatigue analysis based on a known initial flaw should also be performed for those components that contain flaw(s) and is performed to assess the stability of the final crack size of the affected component at the end of the license. This analysis will demonstrate that the component has sufficient fracture toughness to resist rapid crack propagation and thus arrest the crack. The method for this calculation would follow the ASME Code Section XI. The LRA discussed this analysis without providing much detail.

In RAI 3.1.2-1 dated April 2, 2007, the staff requested that the applicant discuss the number of years assumed in the associated fatigue crack growth analysis, and to discuss whether the affected components are demonstrated to be acceptable for the period of extended operation.

In the applicant's response to RAI 3.1.2-1 dated April 24, 2007, the applicant indicated particular flaw and mechanic fracture evaluations as potential TLAAs for the LRA under 10 CFR 54.3 TLAA criteria. The staff reviewed these flaw and fracture evaluations against the 10 CFR 54.3 TLAA definition criteria to determine whether they should have been indicated as TLAAs for the LRA. The staff's assessment of these flaw and fracture evaluations is in SER Section 4.7.4.

As required by 10 CFR 54.21(c)(2), the applicant must list all exemptions granted under 10 CFR 50.12, based on TLAAs, and evaluated and justified for continuation through the period of extended operation. The LRA states that each active exemption was reviewed to determine whether it was based on a TLAA. The applicant did not identify any TLAA-based exemptions. Based on the information provided by the applicant regarding the process used to identify these exemptions and its results, the staff concludes, in accordance with 10 CFR 54.21(c)(2), that the

applicant identified no TLAA-based exemptions justified for continuation through the period of extended operation.

4.1.3 Conclusion

On the basis of its review, the staff concludes that the applicant 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 no exemption to 10 CFR 50.12 had been granted based on a TLAA.

4.2 Reactor Vessel Neutron Embrittlement

The regulations governing reactor vessel integrity are in 10 CFR Part 50. Section 50.60 of 10 CFR requires that all light-water reactors meet the fracture toughness, pressure-temperature (P-T) limits, and material surveillance program requirements for the reactor coolant pressure boundary as set forth in 10 CFR Part 50, Appendices G and H. The JAFNPP CLB analyses evaluating reduction of fracture toughness of the reactor vessel for 40 years are TLAA. The reactor vessel neutron embrittlement TLAA has been projected to the end of the period of extended operation as summarized below. Because the reactor has not been operated at its effective full-power (EFPY), the fifty-four EFPYs are thus projected for the end of the period of extended operation (60 years) based on an average capacity factor of 90 percent.

4.2.1 Reactor Vessel Fluence

4.2.1.1 Summary of Technical Information in the Application

LRA Section 4.2.1 summarizes the evaluation of reactor vessel fluence for the period of extended operation. Calculated fluence based on a time-limited assumption defined by the operating term is the time-limited assumption for the TLAAs that evaluate reactor vessel neutron embrittlement. The current fluence values calculated by General Electric (GE) are documented in the GE-NE-B1100732-01 report on analysis of the 120° capsule removed at 13.4 EFPYs of operation. The 32 EFPY fluence is based on a GE analysis of measured fluence from the surveillance flux wires allowing for 5-percent power uprate completed after flux wire removal. These fluence values further extrapolated to 54 EFPY obtain peak plate inside diameter (ID) fluences with 1/4-thickness values derived from Regulatory Guide (RG) 1.99 formulae and conservative wall thicknesses. The beltline for 40 years consists of six plates (C3103-2, C3278-2, C3301-1, C3368-1, C3376-2, and C3394-1), six axial welds (1-233A/B/C and 2-233A/B/C), and one circumferential weld (1-240) all adjacent to the active fuel zone. There are no nozzles in the beltline region for the current term of operation. Re-evaluation of the beltline for 60 years is based on the axial flux profile and the active fuel and nozzle elevations. Fluence at the recirculation inlet nozzles will not exceed 1.0 x 10^{17} n/cm^2 during the period of extended operation. The plate and weld material in the beltline remain the limiting materials for the period of extended operation.

4.2.1.2 Staff Evaluation

The staff reviewed LRA Section 4.2.1, pursuant to 10 CFR 54.21(c)(1). The staff reviewed the GE-NE-B1100732-01 report on analysis of the 120° capsule removed at 13.4 EFPYs of operation to confirm that the calculation of these fluence values in accordance with the guidance of RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence."

Review of this report indicates several discrepancies with respect to the guidance in RG 1.190 for calculational and dosimetry methods for determining pressure vessel neutron fluence. Examples of such deviations are:

- Fluence values from dosimeter wire measurements were used for the extrapolation, which is not an acceptable practice
- In Section 4.1.1, the report indicates that the iron wire was used for the extrapolation, however, on the next page, equation 4-1 shows values for the copper wire without an explanation for the change
- In Section 4.2.2, flux uncertainties are reported to be in the 25 to 30 percent (1σ), however, these values (1) are outside the recommended range, (2) are not complete and (3) do not show the calculational method
- The dosimetry analysis was based on an empirical GE cross section set, while RG 1.190 recommends use of the current version of the Evaluated Nuclear Data File/B cross sections

For the above reasons and the information available at this time, the staff finds the projected fluence values unacceptable. **This is Open Item (OI) 4.2.1-1.**

4.2.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of reactor vessel fluence in LRA Section A.2.2.1.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address reactor vessel fluence is adequate.

4.2.1.4 Conclusion

Upon resolution of OI 4.2.1-1, the staff will determine whether the reactor vessel fluence TLAA complies with the 10 CFR 54.21(c)(1)(ii) acceptance criterion for TLAAs. The staff also will decide whether the UFSAR supplement contains an appropriate summary description of the TLAA for the reactor vessel fluence for the period of extended operation, as required by 10 CFR 54.21(d).

4.2.2 Pressure-Temperature Limits

4.2.2.1 Summary of Technical Information in the Application

LRA Section 4.2.2 summarizes the evaluation of P-T limits for the period of extended operation. The adjusted reference temperature (ART) is a key material property for the development of

operating P-T limits. The ART is the sum of the initial reference temperature (nil-ductility transition) (RT_{NDT}), ΔRT_{NDT}, and margins for uncertainties at a specific reactor vessel location. Neutron embrittlement increases the ART value, thus increasing the minimum metal temperature at which a reactor vessel is allowed to be pressurized. The ART value for the limiting beltline material determines the beltline P-T limits to account for irradiation effects. Part 50 of 10 CFR, Appendix G, requires operating P-T limits for three categories of operation: (1) hydrostatic pressure and leak tests, (2) nonnuclear heatup and cooldown operations, including low-level reactor physics tests, and (3) core critical operations. As the calculations of P-T limits satisfy 10 CFR 54.3(a) criteria, this topic is a TLAA. These limits are established by calculations that utilize the materials and fluence data from the Reactor Vessel Surveillance Program.

Technical specifications (TS) have P-T limits valid through 32 EFPY. The fact that the projected maximum RT_{NDT} is well below the 200 °F suggested in RG1.99, Section 3, gives confidence that P-T curves will provide an acceptable operating area through 54 EFPY. The Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (BWRVIP Reports 86-A, 102, 116 and 135), as approved by the NRC, will be used to adjust projected RT_{NDT} values as additional surveillance capsule results are collected. The applicant will submit additional P-T curves prior to 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 applicant’s Table 4.2-3 shows the projected 54 EFPY fluence and ART values for the period of extended operation. The staff finds that the projected 54 EFPY fluence and ART values are in fact less than the 200 °F suggested in RG 1.99, Section 3.

The staff’s review of LRA Section 4.2.2 found areas in which additional information was necessary to completed the review of the applicant’s TLAA evaluation. The applicant responded to the staff’s requests for additional information (RAIs) as discussed below.

In RAI 4.2.2-1 dated January 12, 2007, the staff asked the applicant to clarify whether the 54 EFPY P-T limit curve bases summarized in LRA Table 4.2-3 take into account power uprate conditions.

In its response dated February 12, 2007, the applicant stated:

> The RT_{NDT} values projected in LRA Table 4.2-3 are based on fluence values of 0.18×10^{19} n/cm^2 (e > 1 MeV) for the lower shell and 0.22×10^{19} n/cm^2 (e > 1 MeV) for the lower intermediate shell. These fluence values included the uprate to 2536 Megawatts thermal at the end of Cycle 12.

The staff’s review of P-T limits was based on the applicant’s fluence values in LRA Section 4.2.1. Until OI 4.2.1-1 is closed, the staff cannot close its review of this TLAA. **This item is sub-Open Item (sOI) 4.2.2-1.**

In RAI 4.2.2-2, dated January 12, 2007, the staff asked the applicant when it intended to submit P-T limit curves for the period of extended operation (54 EFPY). This request followed the requirement that P-T limits for the period of extended operation must be approved by the staff in accordance with 10 CFR Part 50, Appendix G, prior to the expiration of the P-T limit curves for the current licensing term.

In its response dated February 12, 2007, the applicant stated:

> In accordance with 10 CFR Part 50.59 (c)(2), Part 50.60, and Appendix G, JAFNPP will submit P-T curves for use past 32 EFPY prior to reaching 32 EFPY.

The staff finds the applicant's plan to manage the P-T limits acceptable because changes to the P-T limit curves will be implemented by the license amendment process (*i.e.*, through revisions of the plant TS) and will meet 10 CFR 50.60 and 10 CFR Part 50, Appendix G, requirements and the TLAA acceptance guidance of SRP-LR Section 4.2.2.1.3.3.

4.2.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of P-T limits in LRA Section A.2.2.1.2.

LRA Section A.2.2.1.2 includes the following UFSAR supplement summary description of the TLAA for the JAFNPP P-T limits:

> The P-T limits were derived from calculations made in accordance with the guidance of ASME Appendix G, as modified by Code Cases N-588 and N-640, ASTM Standards, 10 CFR 50 Appendices G and H, Regulatory Guide 1.99 Revision 2, and Generic Letter 88-11.
>
> Pressure-temperature limits are valid through 32 EFPY. The fact that the projected maximum RT_{NDT} is well below the 200°F suggested in Section 3 of Regulatory Guide 1.99, gives confidence that P-T curves will provide acceptable operating area through 54 EFPY. The BWRVIP Integrated Surveillance Program (BWRVIP Reports 86-A, 102, 116 and 135) will be used to adjust projected RTNDT values as additional surveillance capsule results are collected. JAFNPP will submit additional P-T curves prior to the period of extended operation.

The applicant's UFSAR Supplement summary description of the TLAA for the P-T limits appropriately describes how the applicant will determine the P-T limits for the period of extended operation for JAFNPP.

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address P-T limits is adequate.

4.2.2.4 Conclusion

The staff reviewed the applicant's TLAA for the P-T limits, as summarized in LRA Section 4.2.2, including RAI responses dated February 12, 2007, and determines that the applicant will submit

an application to amend the P-T limits for the period of extended operation in accordance with the regulatory requirements. The staff therefore concludes that the applicant's TLAA for the P-T limits will comply with the 10 CFR 54.21(c)(1)(ii) acceptance criterion for TLAAs when the amendment application to revise the P-T limits for the period of extended operation is submitted, the staff-approved P-T limits are incorporated into the TS, and sOI 4.2.2-1 is resolved. Safety margins established and maintained during the current operating license term will be maintained during the period of extended operation as required by 10 CFR 54.21(c)(1).

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in accordance with 10 CFR 54.21(c)(1)(ii), that, for P-T limits, the analyses have been projected to the end of the period of extended operation, pending resolution of sOI 4.2.2-1. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA for the P-T limits for the period of extended operation, as required by 10 CFR 54.21(d).

4.2.3 Charpy Upper-Shelf Energy

4.2.3.1 Summary of Technical Information in the Application

LRA Section 4.2.3 summarizes the evaluation of Charpy Upper-Shelf Energy (C_VUSE) for the period of extended operation. Appendix G of 10 CFR Part 50 requires reactor vessel beltline materials to "have Charpy upper shelf energy … of no less than 75 ft-lb initially and must maintain Charpy upper-shelf energy throughout the life of the vessel of no less than 50 ft-lb." The initial (unirradiated) USE values for JAFNPP beltline materials were provided in correspondence responding to Generic Letter (GL) 92-01 and are now included in Reactor Vessel Integrity Database 2 and BWRVIP-135. RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," provides two methods for determining C_VUSE. Position 1 applies for material without surveillance data and Position 2 for material with at least two sets of surveillance data. The applicant has two surveillance data sets from the reactor vessel plate material showing changes in C_VUSE; however, as the observed changes are less than the RG 1.99 projected changes, Position 1 is used and conservatively does not reduce the projections based on surveillance data. For Position 1, the percentage drop in C_VUSE for a stated copper content and neutron fluence is determined by reference to Figure 2 of RG 1.99, Revision 2. This percentage drop applied to the initial C_VUSE obtains the adjusted C_VUSE.

The reactor vessel plates are projected to remain above 50 ft-lb; consequently, no equivalent margin analysis is required for the plates. However, no initial C_VUSE is available for the reactor vessel weld material, so the decrease from the original value cannot be calculated, and an equivalent margin analysis must be done. The applicant updated the originally submitted equivalent margin analyses for plates and welds to include the second surveillance capsule data. The results show that the reduction in C_VUSE calculated for the plates and welds remains less than the limiting reduction calculated in BWRVIP-74-A and acceptable for the period of extended operation. All equivalent margin analyses for reactor vessel welds show C_VUSE reductions less than those of BWRVIP-74-A and all C_VUSE TLAAs extrapolated through the period of extended operation are acceptable. These TLAAs have been projected to the end of the period of extended operation.

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.

Section IV.A.1 of 10 CFR Part 50, Appendix G, requires reactor vessel beltline materials to have CvUSE values greater than or equal to 50 ft-lb (68 J) throughout a facility's operating license period unless lower CvUSE values can be demonstrated, in a manner approved by the Director, Office of Nuclear Reactor Regulation, to ensure margins of safety against fracture equivalent to those required by American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) Section XI, Appendix G.

On September 21, 1999, the BWRVIP submitted Topical Report TR-1113596, "BWRVIP-74: BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal" (BWRVIP-74). BWRVIP-74, Appendix B, assessed the license renewal actions needed to demonstrate that plant-specific equivalent margin analyses (EMAs) on USE would be acceptable for periods of extended operation. The staff issued its final SER (FSER) on BWRVIP-74 on October 18, 2001. In this FSER, the staff established the following position on acceptance of TLAAs on USE/EMA:

> Section IV.A.1a. of Appendix G to 10 CFR Part 50 requires, in part, that RPV beltline materials shall have Charpy USE in the transverse direction for base metal and along the weld for weld material of no less than 50 ft-lb (68J), unless it is demonstrated in a manner approved by the Director, Office of Nuclear Reactor Regulation, that lower values of Charpy USE will provide margins of safety against fracture equivalent to those required by Appendix G of Section XI of the ASME Code.
>
> By letter dated April 30, 1993, the Boiling Water Reactor Owner's Group (BWROG) submitted a topical report entitled '10 CFR 50 Appendix G Equivalent Margins Analysis for Low Upper Shelf Energy in BWR/2 Through BWR/6 Vessels,' to document that BWR RPVs could meet the margins of safety against fracture equivalent to those required by Appendix G of the ASME Code for Charpy USE values less than 50 ft-lb. In a letter dated December 8, 1993, the staff concluded that the topical report demonstrated that the materials evaluated had the margins of safety against fracture equivalent to Appendix G of the ASME Code, in accordance with Appendix G of 10 CFR Part 50. In this report, the BWROG derived through statistical analysis the initial USE values for materials that originally did not have documented Charpy USE values. Using these statistically derived Charpy USE values, the BWROG predicted the end-of life (40 years of operation) USE values in accordance with RG 1.99, Revision 2 (RG 1.99, Rev. 2). According to this RG, the decrease in USE is dependent upon the amount of copper in the material and the neutron fluence predicted for the material. The BWROG analysis determined that the minimum allowable Charpy USE in the transverse direction for base metal and along the weld for weld metal was 35 ft-lb.
>
> Appendix B in the BWRVIP-74 report provides a bounding Charpy USE for BWR plants for 54 EFPY. The BWRVIP-74 analysis utilized an unirradiated Charpy USE

in the longitudinal direction of 91 ft-lb for BWR/3-6 plates and 70.5 ft-lb for non-Linde 80 submerged arc welds. The value for the plates is the lowest value from the database and is less than the lower 95/95 confidence value. The value for the non-Linde 80 submerged arc welds is the value corresponding to the lower 95/95 confidence value. Since these values are statistically determined with at least 95/95 confidence, these values may be used in the evaluation of Charpy USE.

The analysis in the BWRVIP-74 report determined the reduction in the unirradiated Charpy USE resulting from neutron radiation using the methodology in RG 1.99, Rev. 2. Using this methodology and using a correction factor of 65-percent for conversion of the longitudinal properties to transverse properties, the lowest irradiated Charpy USE at 54 EFPY for all BWR/3-6 plates is projected to be 45 ft-lb. The correction factor for specimen orientation in plates is based on NRC Branch Technical position MTEB 5-2. Using the RG methodology the lowest irradiated Charpy USE at 54 EFPY for BWR non-Linde 80 submerged arc welds is projected to be 43 ft-lb. The BWRVIP-74 report indicates that the percent reduction in Charpy USE for the limiting BWR/3-6 plates and BWR non-Linde 80 submerged arc welds are 23.5 percent and 39 percent, respectively. To demonstrate that the beltline materials meet the criteria specified in the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR/3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, Revision 2. This is Renewal Applicant Action Item 10.

Section IV.A.1.a of 10 CFR Part 50, Appendix G, requires reactor vessel beltline materials to have CvUSE values of no less than 50 ft-lb in the transverse direction for base metal and along the weld for weld material unless lower CvUSE values can be demonstrated, in a manner approved by the Director, Office of Nuclear Reactor Regulation, to ensure margins of safety against fracture equivalent to those required by ASME Code Section XI, Appendix G.

According to RG 1.99, Revision 2, the predicted decrease in USE due to neutron embrittlement during plant operation depends upon the amount of copper in the material and its predicted neutron fluence. RG 1.99, Revision 2, Position 1, specifies methods for calculating the predicted decrease in USE for materials without sufficient credible surveillance data available. The staff confirmed that the initial USE values were based appropriately on the applicant’s previous response to GL 92-01. The applicant appropriately determined the predicted end of life (EOL) USE values for the reactor vessel beltline materials for the period of extended operation by applying the predicted percentage decrease in USE from RG 1.99, Revision 2, to the initial USE values.

The applicant submitted plant-specific information in LRA Table 4.2-1 to demonstrate that all reactor vessel beltline materials meet 10 CFR Part 50, Appendix G, USE requirements at the end of the license renewal period.

Table 4.2.3.2-1 Results of Applicant's and the Staff's Independent Upper-Shelf Energy/Equivalent Margin Analysis Calculations for the Limiting Plate and Weld Materials for Upper-Shelf Energy

JAFNPP Reactor Vessel Material	End Of Life Upper-Shelf Energy for Limiting Materials		End Of Life Upper-Shelf Energy Acceptance Criterion	Evaluation Result
	Applicant	Staff		
Limiting Plate Heat C3368-1	57.2 ft-lb	57.4 ft-lb	USE Requirements in 10 CFR Part 50, Appendix G USE must be > 50 ft-lb	Acceptable per 10 CFR 54.21(c)(1)(ii)
Limiting Weld 1-240	31.5% Drop in USE	29.8% Drop in USE	EMA Requirements in 10 CFR Part 50, Appendix G and the Generic BWRVIP-74A EMA Criteria for RPV SAW Welds made from Non-Linde 80 Flux Materials - Percent drop in USE must be < 39%	Acceptable per 10 CFR 54.21(c)(1)(ii)

In RAI 4.2.3-1 dated January 12, 2007, the staff referred to LRA Table 4.2-1 and asked the applicant to clarify whether any other surveillance capsule data was available and, if so, to address how the data affects the response to RAI 4.2.2-1.

In its response dated February 12, 2007, the applicant stated:

> JAFNPP has withdrawn and analyzed two surveillance capsules (GE-NE-B1100732-01, Revision 1, February, 1998, Plant Fitzpatrick RPV Surveillance materials Testing and Analysis of 120° Capsule at 13.4 EFPY).
>
> With regards to the reactor vessel plate material, this has provided two data sets showing the changes in C_VUSE and RT_{NDT}. However, as the observed changes are less than the Regulatory Guide 1.99 projected changes, this report has used Regulatory Guide 1.99 Position 1 and conservatively not reduced the projections based on surveillance data.
>
> With regards to the reactor vessel weld material, there are no surveillance data sets. This is because the initial C_VUSE and RT_{NDT} for the weld material are not known, and consequently the decrease from the original value cannot be calculated. Consequently, this report has also used Regulatory Guide 1.99 Position 1 for the weld material evaluations.
>
> The two capsules were withdrawn at 5.98 EFPY (1985) and 13.4 EFPY (1996).

> Both were withdrawn prior to the power uprate. However, the fluence projections to 32 EFPY based on these capsules was adjusted to account for the power uprate. So there is no adjustment to the answer to RAI 4.2.2-1.

Based on its review, the staff finds the applicant's response to RAI 4.2.3-1 acceptable.

The staff determined that the applicant correctly used RG 1.99, Revision 2, Position 1, for conservative calculation of the predicted percentage decrease in USE for the period of extended operation. The staff also independently calculated EOL USE values for the beltline plate materials at 54 EFPY and EMAs of the percent drop in USE for the beltline weld materials through 54 EFPY. The staff verified the reduction in the USE values from neutron irradiation using the methodology in RG 1.99, Revision 2, and finds that all the beltline materials meet 10 CFR Part 50, Appendix G, EOL USE or EMA requirements and the staff's criteria in SRP-LR Section 4.2.3.1.1.2 for accepting USE/EMA TLAAs in accordance with 10 CFR 54.21(c)(1)(ii). Table 4.2.3.2-1 summarizes the results of both the applicant's and the staff's independent USE/EMA calculations for the limiting plate and weld materials for USE.

The staff's review was based on the fluence values provided by the applicant in LRA Section 4.2.1. Until OI 4.2.1-1 is closed, the staff cannot close its review of this TLAA. **This item is sOI 4.2.3-1.**

4.2.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of C_VUSE in LRA Section A.2.2.1.3.

> The predictions for percent drop in C_VUSE at 54 EFPY are based on chemistry data and unirradiated C_VUSE data submitted to the NRC in the JAFNPP response to GL 92 01, and 1/4 T fluence values.
>
> The 54 EFPY C_VUSE values were calculated using Regulatory Guide 1.99, Position 1, Figure 2; specifically, the formula for the lines was used to calculate the percent drop in C_VUSE.
>
> All C_VUSE values are predicted to remain well above the requirement of 50 ft-lbs during the period of extended operation. As such, this TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant's UFSAR supplement summary description is consistent with the staff analysis for the TLAA of the USE in SER Section 4.2.3.2. The UFSAR supplement summary description summarizes the applicable USE requirements that must be met for continued compliance with 10 CFR Part 50, Appendix G, during the period of extended operation. The staff therefore finds the UFSAR supplement summary description for the TLAA of the USE acceptable. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address C_VUSE is adequate.

4.2.3.4 Conclusion

The staff reviewed the applicant's TLAA of the USE, as summarized in LRA Section 4.2.3, including RAI responses dated February 12, 2007, and determines that the reactor vessel beltline materials will continue to comply with 10 CFR Part 50, Appendix G, USE requirements throughout the period of extended operation. The staff therefore concludes that the applicant's TLAA for the USE complies with the 10 CFR 54.21(c)(1)(ii) acceptance criterion for TLAAs and that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation as required by 10 CFR 54.21(c)(1), pending resolution of sOI 4.2.3-1.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that, for C_VUSE, the analyses have been projected to the end of the period of extended operation, pending resolution of sOI 4.2.3-1. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.4 Adjusted Reference Temperature

4.2.4.1 Summary of Technical Information in the Application

LRA Section 4.2.4 summarizes the evaluation of ART for the period of extended operation. Irradiation by high-energy neutrons raises the RT_{NDT} value for the reactor vessel. Testing of unirradiated material specimens determines the initial $RT_{NDT.}$ The shift in reference temperature, ΔRT_{NDT}, is the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. The ART is defined as initial RT_{NDT} + ΔRT_{NDT} + margin. RG 1.99, Revision 2, defines the calculation for ΔRT_{NDT}, margin, and ART. The P-T curves are developed from the ART value for the vessel materials. The applicant projected values for ΔRT_{NDT} and ART at 54 EFPY using the methodology of RG 1.99 Position 1. LRA Table 4.2-3 shows the projected ART values calculated from the chemistry data, margin values, initial RT_{NDT} values, and chemistry factors (CFs) in the applicant's response to GL 92-01. The new ΔRT_{NDT} values were calculated by multiplying the CF and the fluence factor for each plate and weld. Calculated margins and the initial RT_{NDT} added to the calculated ΔRT_{NDT} arrived at the new ART value. All projected ART values are well below the 200 °F suggested in RG 1.99 Section 3 (for 1/4 thickness) and acceptable for the period of extended operation. The ART TLAA is thus projected through the period of extended operation.

4.2.4.2 Staff Evaluation

The staff reviewed LRA Section 4.2.4, to verify 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 1/4T RT_{NDT} values for the reactor vessel beltline materials are inputs to the P-T limit curve calculations required by 10 CFR Part 50, Appendix G, for operating reactors. These 1/4 RT_{NDT} values are in accordance with the recommended methodology of RG 1.99, Revision 2, "Radiation Embrittlement of Reactor Vessel Materials," May 1988, accessible through the NRC Agencywide Documents and Access Management Systems (ADAMS) at Accession No. ML003740284.

The 10 CFR Part 50, Appendix G, fracture toughness requirements (including requirements for USE and for P-T limits) apply to all “ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light-water reactors to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service life.” The Rule requires that USE and RT_{NDT} values calculated in accordance with the Rule’s requirements must account for the effects of neutron radiation, including the impacts of implementation of the plant’s reactor vessel surveillance program in accordance with 10 CFR Part 50, Appendix H. For ferritic components in the reactor coolant pressure boundary (RCPB), the changes in fracture toughness properties from neutron radiation are bounded by those in the ferritic materials located in the reactor vessel beltline region.

The staff independently calculated the 1/4T RT_{NDT} values for the reactor vessel beltline materials through 54 EFPY, applying the calculation methods of RG 1.99, Revision 2, and the 1/4T neutron fluences for materials as the bases for its independent calculations. The fluence table of LRA Section 4.2.1 lists these fluences for 54 EFPY of power operation. The staff’s basis for acceptance of the applicant’s 1/4T neutron fluences for 54 EFPY is in SER Section 4.2.1.2.

The staff also determined that the BWRVIP’s integrated surveillance program (ISP) applies in monitoring changes in fracture toughness for the reactor vessel; however, as the ISP surveillance materials, which represent the reactor vessel limiting materials, are not heat-to-heat matches, calculations of changes in RT_{NDT} do not use the ISP surveillance capsule test materials directly. The staff, therefore, determined that to apply the RG 1.99, Revision 2, CF tables as the bases for determination of the CF values in the 1/4T RT_{NDT} calculations was appropriate. This application is consistent with the recommended methodology of RG 1.99, Revision 2, Position 1.1.

The staff confirmed that lower shell axial welds 2-233 A, B, and C fabricated from Heat No. 27204/12008 were the limiting 1/4T RT_{NDT} components in the reactor vessel. The staff calculated a limiting 1/4T RT_{NDT} value of 132.1 °F for this plate material as based on use of the CF table for plate/forging materials in RG 1.99, Revision 2, and a 1/4T fluence of 0.174 x 10^{19} n/cm^2 (E > 1.0 MeV) at 54 EFPY. The 1/4T RT_{NDT} value calculated by the staff at 54 EFPY is within 3.2 °F of the 1/4T RT_{NDT} value calculated by the applicant for this material (*i.e.*, 135.3 °F at 54 EFPY by the applicant’s calculation). As the staff’s independent 1/4T RT_{NDT} value is in excellent agreement with the value calculated by the applicant, the staff found that the applicant had calculated and projected a valid limiting 1/4T RT_{NDT} value for the reactor vessel at 54 EFPY and that the TLAA on 1/4T RT_{NDT} values for the reactor vessel through 54 EFPY is acceptable, as evaluated in accordance with the 10 CFR 54.21(c)(1)(ii) criterion.

The staff’s review was based on the fluence values provided by the applicant in LRA Section 4.2.1. Until OI 4.2.1-1 is closed, the staff cannot close its review of this TLAA. **This item is sOI 4.2.4-1.**

4.2.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of ART in LRA Section A.2.2.1.4.

> JAFNPP has projected values for RT_{NDT} and adjusted reference temperature (ART) at 54 EFPY using the methodology of Regulatory Guide 1.99. These values were calculated using the chemistry data, margin values, initial RT_{NDT} values, and chemistry factors (CFs) contained in the JAFNPP response to GL 92-01 and other licensing correspondence. New fluence factors (FFs) were calculated using the expression in Regulatory Guide 1.99, Revision 2, Equation 2 using 54 EFPY fluence values.
>
> The RT_{NDT} TLAA has been projected through the period of extended operation, with acceptable results, in accordance with 10 CFR 54.21(c)(1)(ii).

The staff concludes that the applicant correctly used the staff-approved methods of RG 1.99, Revision 2 for calculating projected 54 EFPY ART values for the reactor vessel beltline materials. The applicant's UFSAR supplement summary description is consistent with the staff analysis for the TLAA of the ART in SER Section 4.2.4.2. Based on this assessment, the staff finds that the UFSAR supplement summary description for the TLAA of the ART calculations acceptable.

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address ART is adequate.

4.2.4.4 Conclusion

The staff reviewed the applicant's TLAA of the ART calculations, as summarized in LRA Section 4.2.4, and determines that the applicant's calculations of the ART values for the reactor vessel beltline materials, as projected through the period of extended operation, conform to the recommended guidelines of RG 1.99, Revision 2. The staff, therefore, concludes that the applicant's TLAA for the ART calculations complies with the 10 CFR 54.21(c)(1)(ii) acceptance criterion for TLAAs and that the safety margins established and maintained during the current operating term will be maintained during the period of extended operation, as required by 10 CFR 54.21(c)(1), pending resolution of sOI 4.2.4-1. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA of the ART calculations for the period of extended operation, as required by 10 CFR 54.21(d).

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that, for ART, the analyses have been projected to the end of the period of extended operation, pending resolution of sOI 4.2.4-1. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.5 Reactor Vessel Circumferential Weld Inspection Relief

4.2.5.1 Summary of Technical Information in the Application

LRA Section 4.2.5 summarizes the evaluation of reactor vessel circumferential weld inspection relief for the period of extended operation. Relief from reactor vessel circumferential weld examination requirements under BWRVIP-05 is for an acceptable probability of failure per reactor operating year based on reactor vessel metallurgical conditions as well as flaw indication sizes and frequencies of occurrence expected at the end of a licensed operating period. The applicant received NRC approval for this relief for the third inservice inspection interval after evaluating the welds to the end of the current operating license (32 EFPY). The changes in metallurgical conditions expected over the period of extended operation require additional evaluation for 54 EFPY. The relief request shows that the reactor vessel parameters after 32 EFPY were within the NRC 32 EFPY bounding Combustion Engineering Owners Group vessel parameters from the BWRVIP-05 SER and a conditional probability of failure for circumferential welds lower than that stated in the BWRVIP-05 final SER.

The staff evaluation of BWRVIP-05 utilized the FAVOR code for a probabilistic fracture mechanics (PFM) analysis to estimate the reactor vessel shell weld failure probabilities. Three key assumptions of the PFM analysis were (1) the neutron fluence was the estimated end-of-license mean fluence, (2) the chemistry values were mean values based on vessel types, and (3) the potential for beyond-design-basis events was considered. LRA Table 4.2-4 compares the reactor vessel limiting circumferential weld parameters to those in the staff evaluation of BWRVIP-05 for the first two key assumptions. The data in the second column (CEOG/32 EFPY) is from SER Table 2.6-4 for BWRVIP-05. The data in the third column (JAFNPP/32 EFPY) is from the SER for JAFNPP Relief Request 17. The data in the fourth column (CEOG/64 EFPY) is from Table 2.6-5 of the final safety evaluation of the BWRVIP-05 Report. The data in the last column is the projected 54 EFPY data for JAFNPP taken from Table LRA 4.2-3. (Consistent with earlier submissions, this table uses surface fluence rather than 1/4 T fluence without margin for RT_{NDT}, so the resulting change in RT_{NDT} differs from that shown in Table 4.2-3.)

The applicant's RPV circumferential weld parameters at 54 EFPY will remain within the NRC (64 EFPY) bounding CEOG parameters from the BWRVIP-05 SER. Although a conditional failure probability has not been calculated, the fact that the values projected to the end of the period of extended operation are less than the 64 EFPY value leads to the conclusions that the RPV conditional failure probability is bounded by the NRC analysis and that the conditional probability of failure for circumferential welds remains below that stated in the BWRVIP-05 final SER. Therefore, this analysis has been projected through the period of extended operation. The procedures and training used to limit cold over-pressure events will be the same as those approved when the applicant requested approval of the BWRVIP-05 technical alternative for the current license term.

The applicant states that the procedures and training for limiting cold over-pressure events will be the same as those approved when it requested approval of the BWRVIP-05 technical alternative for the current license term.

4.2.5.2 Staff Evaluation

The staff reviewed LRA Section 4.2.5, to verify pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation. The staff's review consisted of the following:

Inservice Inspection Requirements. Inservice inspection (ISI) of ASME Code Classes 1, 2, and 3 components is in accordance with ASME Code Section XI and applicable addenda as required by 10 CFR 50.55a(g) except where specific relief has been granted pursuant to 10 CFR 50.55a(g)(6)(i). Section 50.55a(a)(3) of 10 CFR states that alternatives to the requirements of paragraph (g) may be used, when authorized, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Classes 1, 2, and 3 components (including supports) must meet the requirements except the design and access provisions and the pre-service examination requirements of ASME Code Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of component construction. The regulations require that component ISIs and system pressure tests conducted during the first and subsequent ten-year intervals comply with the requirements in the latest edition and addenda of ASME Code Section XI incorporated by reference in 10 CFR 50.55a(b) twelve months prior to the start of the 120-month interval subject to the limitations and modifications listed therein.

Augmented ISI Requirements for Reactor Vessel Shell Welds. Section 50.55a(g)(6)(ii)(A)(2) of 10 CFR requires applicants to augment their reactor vessel examinations by implementing, as part of the ISI interval in effect on September 8, 1992, the examination requirements for reactor vessel shell welds specified in ASME Code Section XI, Item B1.10, Table IWB-2500-1, Examination Category B-A, "Pressure Retaining Welds in Reactor Vessel." ASME Code Section XI, Item B1.10, includes the volumetric examination requirements for both circumferential reactor vessel shell welds, as specified in ASME Code Section XI, Item B1.11, and longitudinal reactor vessel shell welds, as specified in ASME Code Section XI, Item B1.12.
Section 50.55a(g)(6)(ii)(A)(2) of 10 CFR defines "essentially 100% examination" as covering 90 percent or more of the examination volume of each weld.

Additional Regulatory Guidance on the NRC Safety Evaluation (SE) of the BWRVIP-05 Report. In a letter dated September 28, 1995, as supplemented by letters dated June 24 and October 29, 1996, May 16, June 4, June 13, and December 18, 1997, and January 13, 1998, the BWRVIP, a technical committee of the BWR Owners Group (BWROG), submitted the proprietary report, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05)." The BWRVIP-05 Report evaluates the current inspection requirements for BWR reactor vessel shell welds, formulates recommendations for alternative inspection requirements, and provides a technical basis for these recommended alternative inspection requirements. As modified, BWRVIP-05 proposed to reduce the scope of inspection of BWR reactor vessel welds from essentially 100 percent of all reactor vessel shell welds to examination of 100 percent of the axial welds and essentially zero percent of the circumferential reactor vessel shell welds except for locations where the axial and circumferential welds intersect.

In addition, the report includes proposed alternatives to ASME Code requirements for successive and additional examinations of circumferential welds, as provided in ASME Cod Section XI, paragraphs IWB-2420 and IWB-2430, respectively.

In the BWRVIP-05 Report, the BWRVIP committee concluded that the conditional probabilities of failure for BWR reactor vessel circumferential welds are orders of magnitude lower than those of the axial welds. As a part of its review of the report, the staff independently assessed the probabilistic fracture mechanics of the results presented in the BWRVIP-05 Report. The staff's assessment conservatively calculated the conditional probability of failure values for reactor vessel axial and circumferential welds during the initial (current) 40-year license period and at conditions approximating an 80-year vessel lifetime for a BWR nuclear plant. The failure frequency is calculated as the product of the frequency for the critical (limiting) transient event and the conditional probability of failure for the weld. The staff determined the conditional probability of failure for axial and circumferential welds in BWR vessels fabricated by Chicago Bridge and Iron (CB&I), Combustion Engineering Owners Group (CEOG), and Babcock and Wilcox (B&W). The determination designated a cold overpressure event that occurred in a foreign reactor as the limiting event for BWR reactor vessels and used the pressure and temperature from this event in the PFM calculations. The staff estimated that the probability for the occurrence of the limiting overpressurization transient was 1×10^{-3} per reactor year.

On July 28, 1998, the staff issued its FSER on BWRVIP-05. This evaluation concluded that the failure frequency of reactor vessel circumferential welds in BWRs was sufficiently low to justify elimination of ISI of these welds and found the BWRVIP proposals on successive and additional examinations of circumferential welds acceptable. The evaluation indicated that the circumferential welds will be examined if axial weld examinations reveal any active degradation mechanism. For each of the vessel fabricators, FSER Table 2.6-4 dated March 7, 2000, shows the conditional failure probabilities for plant-specific conditions with the highest projected mean ART for each weld type proposed by the respective fabricator (*i.e.*, mean RT_{NDT} calculations for each of the CB&I, CEOG, and B&W limiting axial weld and limiting circumferential weld case studies) through the expiration of the initial 40-year license period (*i.e.*, 32 EFPY) for a BWR-designed nuclear power plant using an 80-percent capacity factor. FSER Table 2.6-5 dated July 28, 1998, shows the conditional failure probabilities for plant-specific conditions with the highest projected mean RT_{NDT} calculations for each of these case studies through the expiration of an 80-year license period, which constitutes the licensing basis of two 20-year periods of extended operation granted for a BWR-designed nuclear power plant using an 80-percent capacity factor (*i.e.*, through 64 EFPY).

The staff amended this FSER in a supplemental FSER to the BWRVIP in a letter to Carl Terry, BWRVIP Chairman, dated March 7, 2000. In this supplemental FSER, the staff updated the interim probabilistic failure frequencies for reactor vessel axial shell welds and revised FSER Table 2.6-4 to correct a typographical error in the 32 EFPY mean RT_{NDT} value cited for the limiting CB&I case study for circumferential welds. The correction changed the 32 EFPY CF for the CB&I case study from 109.5°F to 134.9°F.

Additional Regulatory Guidance in NRC Generic Letter 98-05. On November 10, 1998, the NRC issued GL 98-05, "Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Welds," which states that BWR applicants may request permanent (*i.e.*, for the remaining term of operation under the initial license) relief from 10 CFR 50.55a(g) ISI requirements for the

volumetric examination of circumferential RPV welds (ASME Code Section XI, Table IWB-2500-1, Examination Category B-A, Item No. B1.11, “Circumferential Shell Welds”) by demonstrating the following safety criteria:

- At the expiration of the operating license, the applicants demonstrate that limiting probability of failure for their limiting reactor vessel circumferential welds will continue to satisfy (*i.e.*, be less than) the limiting conditional failure probability for circumferential weld assessed in the applicable BWRVIP-05 limiting case study.
- Applicants implement operator training and establish procedures that limit the frequency of cold overpressure events to that specified in the staff FSER of July 28, 1998.

In GL 98-05, the staff stated that applicants applying the BWRVIP-05 criteria must continue the volumetric inspections of all axial reactor vessel shell welds required by ASME Code Section XI, Table IWB-2500-1, Inspection Category B-A, Item B1.12, and the augmented volumetric inspections of the reactor vessel axial shell welds required under 10 CFR50.55a(g)(6)(ii)(A)(2). For plants currently operating in accordance with their initial 40-year operating licenses, the limiting case studies are in revised FSER Table 2.6-4 dated March 7, 2000, covering BWRVIP-05. For plants granted operating licenses to operate for an period of extended operation, the limiting case studies are in FSER Table 2.6-5 dated July 28, 1998.

Additional Regulatory Guidance in the NRC SER on Topical Report BWRVIP-74 Applicable to BWR Industry Relief Requests on Reactor Vessel Circumferential Weld Examinations. On September 21, 1999, the BWRVIP submitted Topical Report TR-1113596, “BWRVIP-74: BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal.” In Section A.4.5 of this topical report, the BWRVIP assessed what applicants for renewal must do in these TLAAs to support 60-year relief requests on the circumferential weld examinations after issuance of renewed operating licenses. The staff issued its SER on BWRVIP-74 on October 18, 2001, stating that applicants requesting renewal of BWR operating licenses must meet the following conditions for the TLAA on reactor vessel circumferential weld relief requests:

- At the expiration of the renewed period, the mean RT_{NDT} values for their reactor vessel circumferential welds would satisfy the limiting conditional failure probability for circumferential welds stated in the staff FSER dated June 28, 1998, as amended by the staff FSER dated March 7, 2000.

- Applicants implement operator training and establish procedures that limit the frequency of cold overpressure events to that specified in the staff FSER on the BWRVIP-05 Report.

The staff identified these conditions as Renewal Applicant Action Item 11. In the staff FSER on BWRVIP-74, the staff also stated that BWR applicants could propose the following alternative to meeting Renewal Applicant Action Item 11:

- A plant-specific assessment of the probability of vessel failure at the end of the renewal period consistent with the analytical approach in the staff FSER on BWRVIP-05, including any subsequent revisions, and based on the chemistry of the limiting circumferential weld and predicted neutron fluence at the end of the period of extended operation. The assessment should demonstrate a calculated probability of failure less than or equal to

that stated in Appendix E of the staff FSER on BWRVIP-05 and should be submitted for inspection relief.

The technical basis for relief from ASME Code Section XI circumferential weld ISI requirements is described in the staff FSER on the BWRVIP-05 Report enclosed in a July 28, 1998, letter from Mr. G.C. Lanais, NRC, to Mr. C. Terry, the BWRVIP Chairman. In this letter, the staff concluded that, because the failure frequency for circumferential welds in BWR plants is significantly below the criterion specified in RG 1.154, “Format and Content of Plant-Specific Pressurized Thermal Shock Safety Analysis Reports for Pressurized Water Reactors,” and below the core damage frequency (CDF) of any BWR plant, the continued inspection would decrease an already acceptably low reactor vessel failure probability negligibly, justifying elimination of the ISI requirements for reactor vessel circumferential welds. The staff letter indicated that BWR applicants may request relief from 10 CFR 50.55a(g) ISI requirements for volumetric examination of circumferential RPV welds by demonstrating that (1) at the expiration of the license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in the staff’s July 28, 1998 evaluation, and (2) the applicants have implemented operator training and established procedures that limit the frequency of cold over-pressure events to that specified in the staff SER. The letter indicated that the requirements for inspection of reactor vessel circumferential welds during an additional 20-year license renewal period would be reassessed plant by plant on any BWR LRA. Therefore, the applicant must request relief from the ISI requirements for volumetric examination of circumferential welds for the period of extended operation in accordance with 10 CFR 50.55a(g).

In accordance with 10 CFR 50.55a(g), the staff requires that a request for relief from ASME Code Section XI circumferential shell weld examination requirements be submitted for the period of extended operation.

In RAI 4.2.5-1 dated January 12, 2007, the staff asked the applicant when it would apply for relief from ASME Code Section XI circumferential weld examination requirements for the period of extended operation.

In its response dated February 12, 2007, the applicant stated that it will submit a prior reactor vessel circumferential weld relief request for each 10-year ISI interval in the period of extended operation.

Based on its review, the staff finds the applicant’s response to RAI 4.2.5-1 acceptable. The staff’s concern described in RAI 4.2.5-1 is resolved.

BWRVIP-74 Report Section A.4.5 indicates that the staff SER on the BWRVIP-05 Report conservatively evaluated the BWR reactor vessels to 64 EFPY, 10 EFPY greater than what is realistically expected for the end of the license renewal period. The staff used the mean RT_{NDT} value to evaluate the failure probability of BWR circumferential welds at 32 and 64 EFPY in the staff SER on the BWRVIP-05 Report dated July 28, 1998. In this evaluation the staff used the neutron fluence at the reactor vessel inner diameter clad-weld interface.

The staff independently calculated the mean RT_{NDT} values for the limiting reactor vessel circumferential weld through 54 EFPY. SER Table 4.2.5-1 summarizes the mean RT_{NDT} value calculated by the staff for the reactor vessel through 54 EFPY and compares the staff's mean RT_{NDT} value to both the corresponding mean RT_{NDT} value calculated by the applicant and the mean RT_{NDT} value criterion for the limiting CEOG case study at 64 EFPY.

The results in SER Table 4.2.5-1 on the following page demonstrate that the mean RT_{NDT} value calculated by the applicant for the reactor vessel circumferential weld is less than that for the limiting CEOG case study and agrees with that calculated by the staff. Based on this analysis, the staff concludes that the applicant has provided a valid basis for the conclusion that the conditional probability of failure for the reactor vessel circumferential weld is sufficiently low to accept the TLAA and set the basis for a relief request to eliminate the reactor vessel circumferential weld examinations for the period of extended of operation after renewal of the operating license. Based on this independent assessment, the staff concludes that the applicant's TLAA on circumferential weld relief requests conforms to Renewal Applicant Action No. 11 on Topical Report BWRVIP-74-A, has been projected to 54 EFPY, and is acceptable pursuant to 10 CFR 54.21(c)(1)(ii).

Table 4.2.5-1 Comparison of NRC and JAFNPP 54 EFPY Mean RT_{NDT} Calculations to the 64 EFPY Mean RT_{NDT} Calculations for the Limiting Combustion Engineering Owners Group Case Study on BWRVIP-05

	Limiting 64 EFPY CEOG Case Study	NRC 54 EFPY Mean RT_{NDT} Calculations for JAFNPP (Note 1)	Applicant 54 EFPY Mean RT_{NDT} Calculations for JAFNPP (Note 1)
Alloy % Cu	0.183	0.337	0.337
Alloy % Ni	0.704	0.609	0.609
$RT_{NDT(U)}$ (°F)	0	-50	-50
Fluence (10^{19} n/cm^2, E > 1.0 MeV)	0.4	0.271	0.271
Chemistry Factor	172.2	209.1	209.1
ΔRT_{NDT} (°F)	128.5	134.7	134.7
Mean RT_{NDT} (°F)	128.5	84.7	84.7
NRC Established Conditional Probability of Failure [P(F/E)] Criterion for Case / Result for Plant Specific Calculation	4.38×10^{-4} (Maximum P(F/E) value to justify relief: Refer to Note 2)	Mean RT_{NDT} is Lower than Case Study Mean RT_{NDT}: Criterion is met. (Note 2)	Mean RT_{NDT} is Lower than Case Study Mean RT_{NDT}: Criterion is met. (Note 2)

Notes: (1) For the reactor vessel, the limiting circumferential weld materials determined by the staff were equivalent to those determined by the applicant. The limiting reactor vessel circumferential weld is 1-240 fabricated from weld heat No. 305414.

(2) If the plant-specific mean RT_{NDT} is less than the mean RT_{NDT} of the limiting case study,

> the staff concludes that probability of failure for the plant-specific circumferential weld under review will be less than the conditional probability of failure for the limiting circumferential weld in the limiting case study. BWR plants that meet this criterion may conclude that the probability of failure for the limiting circumferential reactor vessel welds is sufficiently low to justify elimination of both volumetric examinations required by ASME Code Section XI (Examination Category B-A, Item B.1.11) and augmented volumetric examinations for the circumferential welds required by 10 CFR 50.55a(g)(6)(ii)(A)(2).

In the SER on BWRVIP-05 dated July 28, 1998, the staff also concluded that examination of the reactor vessel circumferential shell welds would be required if the corresponding volumetric examinations of the reactor vessel axial shell welds revealed any age-related degradation mechanism.

In RAI 4.2.5-2 dated January 12, 2007, the staff asked the applicant to confirm whether previous volumetric examinations of the reactor vessel axial shell welds showed any indication of cracking or other age-related degradation mechanisms.

In its response dated February 12, 2007, the applicant stated that no unacceptable inservice examination indications have been found on reactor vessel welds (circumferential or axial).

Based on its review, the staff finds the applicant's response to RAI 4.2.5-2 acceptable. The staff's concern described in RAI 4.2.5-2 is resolved.

The BWRVIP-05 Report uses no margin term for calculations of surface mean RT_{NDT} for reactor vessel circumferential welds.

In RAI 4.2.5-3 dated January 12, 2007, the staff asked the applicant to clarify the inclusion of a margin term in LRA Table 4.2-4 and in LRA Section 4.2.5.

In its response dated February 12, 2006, the applicant stated:

> Note that all the margin entries in Tables 4.2-4 and 4.2-5 are zero, and are therefore consistent with the BWRVIP-05 SER. The margin line in Tables 4.2-4 and 4.2-5 were intended to show that the margin called for by RG 1.99 when calculating RT_{NDT} are set to zero here, clearly showing why these RT_{NDT} values are different from the RG 1.99 compliant values calculated in Table 4.2-3.

Based on its review, the staff finds the applicant's response to RAI 4.2.5-3 acceptable. The staff's concern described in RAI 4.2.5-3 is resolved.

The applicant states that the procedures and training for limiting cold over-pressure events will be the same as those approved when it requested relief from reactor vessel circumferential weld examination requirements for the current license period in accordance with BWRVIP-05.

The staff finds the applicant's evaluation for this TLAA acceptable because its 54 EFPY conditional failure probability for the reactor vessel circumferential welds is bounded by the analysis in the staff SER dated July 28, 1998, and because the applicant will use procedures and training for limiting cold over-pressure events during the period of extended operation.

This analysis satisfies the evaluation requirements of the staff SER dated July 28, 1998; however, the applicant still must request relief for the circumferential weld examination for the period of extended operation in accordance with 10 CFR 50.55a.

The staff's review was based on the fluence values in LRA Section 4.2.1. Until OI 4.2.1-1 is closed, the staff cannot close its review of this TLAA. **This item is sOI 4.2.5-1.**

4.2.5.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of reactor vessel circumferential weld inspection relief in LRA Section A.2.2.1.5:

> Relief from reactor vessel circumferential weld examination requirements under Generic Letter 98-05 is based on assessments indicating an acceptable probability of failure per reactor operating year. The analysis is based on reactor vessel metallurgical conditions as well as flaw indication sizes and frequencies of occurrence that are expected at the end of a licensed operating period.
>
> JAFNPP received NRC approval for this relief for the remainder of the original 40-year license term. The basis for this relief request is an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license, based on the NRC SERs for BWRVIP-05 and BWRVIP-74 and the extent of neutron embrittlement.
>
> The JAFNPP reactor pressure vessel circumferential weld parameters at 54 EFPY will remain within the NRC's (64 EFPY) bounding CEOG parameters from the BWRVIP-05 SER. Although a conditional failure probability has not been calculated, the fact that the JAFNPP values at the end of license are less than the 64 EFPY value provided by the NRC leads to the conclusion that the JAFNPP RPV conditional failure probability is bounded by the NRC analysis. As such, the conditional probability of failure for circumferential welds remains below that stated in the NRC's Final Safety Evaluation of BWRVIP-05. Therefore, this analysis has been projected through the period of extended operation per 10 CFR 54.21 (c)(1)(ii).

The applicant's UFSAR supplement summary description for the TLAA of the reactor vessel circumferential weld examination relief explains appropriately how the conditional failure probability for the reactor vessel circumferential welds is bounded by the analysis in the staff SER dated July 28, 1998. The applicant's UFSAR supplement summary description is consistent with the staff analysis for the TLAA of the reactor vessel circumferential weld examination relief in SER Section 4.2.5.2. Based on this assessment, the staff finds the UFSAR supplement summary description for the TLAA of the reactor vessel circumferential weld examination relief acceptable.

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address reactor vessel circumferential weld inspection relief is adequate.

4.2.5.4 Conclusion

The staff reviewed the applicant's TLAA of the reactor vessel circumferential weld examination relief, as summarized in LRA Section 4.2.5, including RAI responses dated February 12, 2007. The staff determines that the applicant appropriately described how the conditional failure probability for the reactor vessel circumferential welds are bounded by the analysis in the staff SER dated July 28, 1998, on the BWRVIP-05 Report and how procedures and training will limit cold over-pressure events during the period of extended operation pending resolution of CI 4.2.5-1. The staff, therefore, concludes that the applicant's TLAA Section 4.2.5 and UFSAR supplement A.2.2.1.5 for reactor vessel circumferential weld examination relief will comply with the 10 CFR 54.21(c)(1)(ii) acceptance criterion for TLAAs.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that, for reactor vessel circumferential weld inspection relief, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.2.6 Reactor Vessel Axial Weld Failure Probability

4.2.6.1 Summary of Technical Information in the Application

LRA Section 4.2.6 summarizes the evaluation of reactor vessel axial weld failure probability for the period of extended operation. The BWRVIP recommendations for inspection of reactor vessel shell welds (BWRVIP-05) are based on generic analyses supporting an SER conclusion that the generic-plant axial weld failure rate is no more than 5×10^{-6} per reactor year. BWRVIP-05 shows that this axial weld failure rate is orders of magnitude greater than the 40-year end-of-life circumferential weld failure probability and uses this analysis to justify relief from inspection of the circumferential welds.

LRA Table 4.2-5 compares the reactor vessel limiting axial weld parameters to those in the staff analysis. The data in the second column (CEOG 32 EFPY) is from Table 2.6-4 of the staff SER on BWRVIP-05. The data in the third column is based on the projected 32 EFPY fluence and the limiting weld chemistry. The data in the fourth column is from Table 2.6-5 of the staff SER on BWRVIP-05. The data in the last column is the projected 54 EFPY data taken from LRA Table 4.2-3. (For consistency with Columns 2 and 3, the EOL mean RT_{NDT} is calculated without margin and hence is lower than the LRA Table 4.2-3 RT_{NDT} value.) The limiting axial weld parameters are within the limits of the values assumed in the BWRVIP-05 supplemental SER analysis and the 64 EFPY limits and values from Table 2.6-5 of that SER. As such, this TLAA has been projected to the end of the period of extended operation.

4.2.6.2 Staff Evaluation

The staff reviewed LRA Section 4.2.6, 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 review consisted of the following:

ISI Requirements, NRC Criteria on the BWRVIP-05 Report, and GL 98-05 Criteria. The regulatory bases for the TLAA on reactor vessel Axial Weld Failure Analyses are in the following subsections of SER Section 4.2.5.2:

- ISI Requirements
- Augmented ISI Requirements for Reactor Vessel Shell Welds
- Additional Regulatory Guidance in the SE of the BWRVIP-05 Report
- Additional Regulatory Guidance in Generic Letter 98-05
- Additional Regulatory Guidance in the SER on Topical Report BWRVIP-74 as Applicable to BWR Industry RV Axial Weld Probability for Failure Analyses

In BWRVIP Section A.4.5, the BWRVIP assessed what applicants for renewal must do in these TLAAs to support submission of 60-year relief requests for circumferential weld examinations after issuance of renewed operating licenses. The staff issued its FSER on BWRVIP-74 on October 18, 2001. In this FSER, the staff assessed the impact of LRAs on reactor vessel axial weld probability of failure analyses:

> The BWRVIP-74 report does not indicate the impact of neutron embrittlement on BWR axially-oriented RPV welds. However, in its July 28, 1998, letter to Carl Terry, the staff identified a concern about the failure frequency of axially-oriented welds in BWR RPVs. In a response to this concern, the BWRVIP provided evaluations of axial weld failure frequency in letters dated December 15, 1998 and November 12, 1999. The staff's evaluation of these analyses is contained in a March 7, 2000, letter to Carl Terry. The FSER enclosed in that letter states that the RPV failure frequency due to failure of the limiting axial welds in the BWR fleet at the end of 40 years of operation is below 5 x 10^{-6} per reactor year, given the assumptions on flaw density, distribution and location, as described in the FSER. Since the results apply only for the initial 40-year license period of BWR plants, LR applicants shall provide plant-specific information applicable to 60 years of operation.
>
> The BWRVIP identified Clinton and Pilgrim as the reactor vessels with the highest mean RT_{NDT} in the BWR fleet. The staff confirmed this conclusion by comparing the information contained in the BWRVIP analysis and the information contained in the reactor vessel integrity database (RVID) for all BWR RPV axial welds. The staff performed analyses of the Clinton and Pilgrim plants. The results from the staff calculations are provided in Table 1. The staff calculations used the basic input information for Pilgrim, with three different assumptions for the initial RT_{NDT}. The calculations of the actual Pilgrim condition used the docketed initial RT_{NDT} of -48 °F and a mean RT_{NDT} of 68 °F. A second calculation, listed as "Mod 1" in Table 1, is consistent with the BWRVIP calculations, with an initial RT_{NDT} of 0 °F and a mean RT_{NDT} of 116 °F. A third calculation, with an initial RT_{NDT} of -2 °F and a mean RT_{NDT} of 114 °F, was performed to identify the mean RT_{NDT} value required to provide a result which closely matches the RPV failure frequency of 5 x 10^{-6} per reactor-year.

Table 1: Comparison of Results from Staff and BWRVIP				
Plant	Initial RT_{NDT} (°F)	Mean RT_{NDT} (°F)	RV Probability of Failure Values (Vessel Failure Freq.)	
			Staff	BWRVIP
Clinton	-30	91	2.73 E -6	1.52 E -6
Pilgrim	-48	68	2.24 E -7	-------
Mod 1 *	0	116	5.51 E -6	1.55 E -6
Mod 2 **	-2	114	5.02 E -6	-------

* A variant of Pilgrim input data, with initial RT_{NDT} = 0 °F.
** A variant of Pilgrim input data, with initial RT_{NDT} = -2 °F

As indicated in the March 7, 2000, letter, an applicant shall monitor the axial beltline weld embrittlement. One acceptable method is to determine the mean RT_{NDT} of the limiting axial beltline weld at the end of the extended period of operation is less than the values specified in Table 1. This is Renewal Applicant Action Item 12.

The staff FSER on BWRVIP-74 states that applicants applying for license renewal of BWR facilities should demonstrate how they satisfy Renewal Applicant Action Item 12. As stated in the quoted NRC position, one acceptable method demonstrates that the mean RT_{NDT} value for the limiting reactor vessel axial beltline weld at the end of the period of extended operation is less than one of the corresponding values specified in Table 1.

In its letter to Mr. C. Terry, the BWRVIP Chairman dated July 28, 1998, the staff stated a concern about the failure frequency of axial welds in BWR reactor vessels.

In its response dated December 15, 1998 and November 12, 1999, the BWRVIP evaluated axial weld failure frequency. The staff's BWRVIP-05 supplemental SER on these evaluations is enclosed in a letter from Mr. J. Strosnider (NRC) to Mr. C. Terry (BWRVIP) dated March 7, 2000. The staff's generic analysis used Pilgrim Nuclear Power Station as a model for BWR-4 reactor vessels and demonstrated that a mean RT_{NDT} of 114°F resulted in a vessel failure frequency of 5 x 10^{-6} per reactor-year of operation. The applicant calculated, and the staff confirmed, that the limiting axial weld mean RT_{NDT} value at 54 EFPY is 97.2°F, which supports the conclusion that the reactor vessel failure frequency will be less than 5 x 10^{-6} per reactor-year of operation at the end of the period of extended operation; therefore, this analysis is acceptable.

The staff's supplemental SER on BWRVIP-05 established that calculation of the mean RT_{NDT} values for a probability of failure is as the sum of the unirradiated ART for the reactor vessel beltline material and the shift in ART value induced by neutron irradiation (*i.e.*, mean RT_{NDT} = $RT_{NDT(U)} + \Delta RT_{NDT}$) and that a margin term uncertainty allowance is not part of the calculation. The

staff independently calculated the mean RT_{NDT} values for the reactor vessel beltline axial welds in accordance with this position.

Table 4.2.6-1 shows the results of the staff's independent calculations and compares the mean RT_{NDT} values calculated by the applicant and the "Mod 2" case study for BWR reactor vessel axial welds. The table also shows the staff's conclusions on whether the vessel failure frequency analysis results for the reactor vessel axial welds are acceptable and the staff's bases for these conclusions.

The staff's independent mean RT_{NDT} value calculations for the reactor vessel beltline axial welds, as summarized in Table 4.2.6-1, are lower than the limiting mean RT_{NDT} values for the Pilgrim "Mod 2" case studies and therefore demonstrate that the vessel failure frequencies for the reactor vessel beltline axial welds are lower than those for the case study. Based on this assessment, the staff concludes that the applicant's TLAA on reactor vessel axial weld failure analyses satisfies Renewal Application Action Item 12 of the staff SER dated October 18, 2001, on BWRVIP-74. The staff further concludes that the TLAA on reactor vessel axial weld failure analyses has been projected to the end of the period of extended operation and is acceptable as evaluated in accordance with the 10 CFR 54.21(c)(1)(ii) criterion.

Table 4.2.6-1 Comparison of NRC and the Applicant's 54 EFPY Mean RT_{NDT} Calculations for JAFNPP Reactor Vessel Beltline Axial Weld Probability of Failure Analyses

	Limiting Pilgrim "Mod 2" Case Study	NRC 54 EFPY Mean RT_{NDT} Calculations for JAFNPP (Note 1)	Applicant 54 EFPY Mean RT_{NDT} Calculations for JAFNPP (Note 1)
Alloy % Cu	0.219	0.219	0.219
Alloy % Ni	0.996	0.996	0.996
$RT_{NDT(U)}$ (°F)	-2.0	-48	-48
Fluence (10^{19} n/cm^2)	0.149	0.255	0.255
Chemistry Factor	232.0	231.1	231.1
ΔRT_{NDT} (°F)	116.0	145.3	145.2
Mean RT_{NDT} (°F)	114.0	97.3	97.2
NRC Vessel Failure Frequency (VFF) Criterion / Conclusion Against the Criterion (Note 3)	5.02×10^{-6} (Maximum VFF Value Refer to: Note 2)	The Mean RT_{NDT} is Lower than the Mean RT_{NDT} in the Pilgrim Mod 2 Case Study: Acceptance criterion is met. (Note 2)	The Mean RT_{NDT} is Lower than the Mean RT_{NDT} in the Pilgrim Mod 2 Case Study: Acceptance criterion is met. (Note 2)

Notes: (1) For the reactor vessel, the limiting axial weld material determined by the staff was equivalent to that determined by the applicant. The limiting reactor vessel axial welds are the Lower Shell Axial Welds 2-233 A, B, and C fabricated from Tandem Weld Heat No. 27204/12008. The staff and the applicant both independently found an $RT_{NDT(U)}$ value of -48.0 °F, a Copper content of 0.219 wt.-%, and a Nickel content of 0.996 wt.-% for this

tandem weld material.

(2) If the plant-specific mean RT_{NDT} is less than the mean RT_{NDT} of the limiting case study, the staff concludes that probability of failure for the plant-specific axial weld under review will be less than the NRC's maximum acceptable vessel failure frequency for the axial weld assessed in the limiting reactor vessel axial weld case study. BWR plants that meet this criterion may conclude that the probability of failure for their reactor vessel beltline axial welds is acceptable and that the TLAA has been sufficiently projected through the expiration of the period of extended operation and is acceptable when evaluated against the 10 CFR 54.21(c)(1)(ii)/2 TLAA acceptance criterion.

(3) In these calculations, calculation of the vessel failure frequency for the axial weld in the case study analyses uses the case study's conditional probability of failure value multiplied by a 1×10^{-3} frequency for initiation of a cold, overpressurization event. Thus, for the staff's calculation of the vessel failure frequencies for the Pilgrim "Mod 2" case studies, the staff determined that the conditional probability for the axial welds was 5.02×10^{-3} for the Pilgrim "Mod 2" case study.

The limiting axial weld failure probability calculated by the staff in the BWRVIP-05 SER Supplement assumes that "essentially 100 percent" (*i.e.*, greater than 90 percent) examination coverage of all reactor vessel axial welds can be achieved in accordance with ASME Code Section XI requirements.

In RAI 4.2.6-1 dated January 12, 2007, the staff asked the applicant whether ISI examinations achieved "essentially 100 percent" (*i.e.*, greater than 90 percent) overall examination coverage of the reactor vessel axial welds for the duration of the current operating license period. If not, the staff requested references to the staff SER granting relief for limited-scope axial weld examination coverage. If less than 90 percent overall examination coverage for the reactor vessel axial welds, the staff asked the applicant to revise its TLAA of the reactor vessel axial welds to account for the effects of the limited-scope examination coverage.

In its response dated February 12, 2007, the applicant stated that, due to various obstructions within the reactor vessel, it had not been able to inspect "essentially 100%" of the reactor vessel beltline axial welds. The applicant currently operates under ISI program relief that authorizes limited-scope examination coverage for specified reactor vessel axial welds. The limited-scope examinations overall covered 88 percent of the axial welds in the beltline region. The staff SER dated July 21, 2004 documents the technical basis for granting this relief from the ASME Code Section XI requirements mandating 100 percent examination coverage of all axial welds.

The applicant stated that the effect of this reduced examination coverage on the axial weld failure probability would be small. The applicant pointed to the large margin between the 84.7°F mean ART and the 128.5°F mean ART for the CEOG plant in the SER on BWRVIP-05 to determine weld failure probability. The applicant determined that the difference between the 88 percent axial weld examination coverage and the 90 percent minimum coverage required to meet the "essentially 100%" examination coverage requirement was unlikely to offset this large margin.

The current relief for the limited-scope axial weld examination coverage is effective only through the end of the current ISI interval and does not authorize reduced examination coverage of reactor vessel axial welds beyond the end of the current ISI interval. The changes in metallurgical

conditions anticipated require an additional analysis for 54 EFPY and NRC approval to extend the reactor vessel axial weld inspection relief through the end of the period of extended operation interval by interval. The applicant must submit, interval by interval, either a request for an alternative to ASME Code Section XI requirements pursuant to 10 CFR 50.55a(a)(3) or a request for relief from ASME Code Section XI requirements pursuant to 10 CFR 50.55a(g)(6)(i) to address future axial weld examinations if it achieves less than “essentially 100%” coverage.

The staff’s review was based on the fluence values in LRA Section 4.2.1. Until open item 4.2.1-1 is resolved, the staff cannot close its review of this TLAA. **This item is sOI 4.2.6-1.**

4.2.6.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of reactor vessel axial weld failure probability in LRA Section A.2.2.1.6:

> The BWRVIP recommendations for inspection of reactor vessel shell welds are based on generic analyses supporting an NRC SER. The generic-plant axial weld failure rate is no more than 5×10^{-6} per reactor year as calculated in the BWRVIP-74 SER. BWRVIP-05 showed that this axial weld failure rate is orders of magnitude greater than the 40 year end-of-life circumferential weld failure probability, and used this analysis to justify relief from inspection of the circumferential welds as described above.
>
> The BWRVIP-74 SER states it is acceptable to show that the mean RT_{NDT} of the limiting beltline axial weld at the end of the period of extended operation is less than the limiting value given in the SERs for BWRVIP-74 and BWRVIP-05. The projected 54 EFPY mean RT_{NDT} values for JAFNPP are less than the limiting 64 EFPY RT_{NDT} in the analysis performed by the NRC staff (Table 2.6-5 of the BWRVIP-05 SER). As such, this TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant’s UFSAR supplement summary description for the TLAA of the reactor vessel axial weld failure probability appropriately describes how the conditional failure probabilities for the reactor vessel axial welds are bounded by the analysis in the staff’s supplemental SER dated March 7, 2000. However, the staff determines that the applicant must include in the UFSAR supplement summary description for this TLAA an additional statement that addresses the limited scope axial weld inspection coverage described in SER Section 4.2.6.2. The statement must indicate specifically that, due to various obstructions within the reactor vessel, the applicant was granted relief from the requirement of “essentially 100 percent” (greater than 90 percent) examination coverage of all reactor vessel axial welds. The staff accepted the applicant’s determination that the limited-scope (less than 90 percent) examination coverage of the reactor vessel axial welds would not offset the large margin between the limiting axial weld mean RT_{NDT} value of 84.7°F at 54 EFPY and the mean RT_{NDT} value of 128.5°F mean ART for the CEOG plant in the staff SER for BWRVIP-05. Therefore, the axial weld failure probability would not exceed 5×10^{-6} per reactor operating year during the period of extended operation. The addition of this statement to the applicant’s UFSAR supplement summary description will be consistent with the staff analysis for the TLAA of the reactor vessel axial weld failure probability in SER Section 4.2.6.2.

In its response dated June 20, 2007, the applicant supplemented its response to RAI 4.2.6.1, and added the following paragraph to UFSAR Section A.2.2.1.6:

> Due to various obstructions within the reactor vessel, Entergy was granted relief by the NRC from the requirements foe “essentially 100" (<90 percent) examination coverage of all reactor vessel axial welds. The staff accepted JAFNPP’s determination that the limited-scope (,90 percent) examination coverage of the reactor vessel axial welds would not offset the large margin between the limiting axial weld mean RTNDT value of 84.7° F for JAFNPP at 54 EFPY and the mean RTNDT value of 128.5° F mean adjusted reference temperature for the CEOG plant used in the NRC SER for BWRVIP-05. Therefore, the axial weld failure probability would not exceed 5x10-6 per reactor operating year during the period of extended operation.

On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address reactor vessel axial weld failure probability is adequate.

4.2.6.4 Conclusion

The staff reviewed the applicant’s TLAA of the reactor vessel axial weld failure probability, as summarized in LRA Section 4.2.6, including its RAI responses dated February 12, 2007, as supplemented by letter dated June 20, 2007, and determines that the applicant appropriately described how the conditional failure probability for the reactor vessel axial welds are bounded by the analysis in the staff supplemental SER dated March 7, 2000, on the BWRVIP-05 Report for the period of extended operation. The staff therefore concludes that the applicant’s TLAA Section 4.2.6 and UFSAR Supplement summary description A.2.2.1.6 are acceptable pending resolution of CI 4.2.6-1. The staff concludes that the applicant’s TLAA Section 4.2.6 and UFSAR Supplement A.2.2.1.6 for the reactor vessel axial weld failure probability will comply with the 10 CFR 54.21(c)(1)(ii) acceptance criterion for TLAAs.

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that, for reactor vessel axial weld failure probability, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d), pending resolution of CI 4.2.6-1.

4.3 Metal Fatigue

Fatigue analyses are potential TLAA for Class 1 and selected non-Class 1 mechanical components. Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses that becomes evident by cracking of the component. Components designed in accordance with ASME Code Section III, Subsection NB, are required to have fatigue analyses. ASME Code Section III requires evaluation of fatigue by considering design thermal and loading cycles. JAFNPP monitors transient cycles that contribute to fatigue usage in accordance with requirements in TS 5.5.5. Cumulative usage factors (CUFs) have been documented and the actual numbers of design transient cycles have been projected to 60 years. A program is in place to track cycles and to provide corrective actions if limits are

approached. The maximum CUFs identified for JAFNPP components are summarized in LRA Table 4.3-1. Reactor coolant system (RCS) pressure boundary piping was designed to American National Standards Institute (ANSI) B31.1 and secondary stresses (e.g., stress due to thermal expansion and anchor movements) are analyzed for fatigue using stress intensification factors (SIFs) and stress range allowables. The stress range allowables are a function of thermal design cycles. In addition to metal fatigue analyses, fracture mechanics analyses of flaw indications discovered during ISI are TLAA for those analyses based on time-limited assumptions defined by the current operating term. When a flaw is detected during ISIs, the component that contains the flaw can be evaluated for continued service in accordance with ASME Code Section XI. These evaluations may show the component is acceptable at the end of the current operating term based on projected inservice flaw growth. Flaw growth is typically predicted based on the design thermal and loading cycles.

A metal component subject to cyclical loading at loads less than the static design load may fail due to fatigue. Evaluations of metal fatigue of components may assume a number of thermal transients or cycles for the current operating term. The validity of such metal fatigue evaluations is reviewed for the period of extended operation. The GALL Report treats fatigue aging-related degradations that require evaluation as TLAAs pursuant to 10 CFR 54.21(c). The applicant's TLAA on metal fatigue is in LRA Section 4.3.

4.3.1 Class 1 Fatigue

JAFNPP Class 1 components evaluated for fatigue and flaw growth include the RPV and appurtenances, certain reactor vessel internals, and the RCS pressure boundary. The JAFNPP Class 1 systems include components within the ASME Code Section XI, Subsection IWB inspection boundary. Fatigue evaluations were performed in the design of the JAFNPP Class 1 components in accordance with the requirements specified in ASME Code Section III. The fatigue evaluations are contained in analyses and stress reports, and because they are based on a number of transient cycles assumed for a 60-year plant life, these evaluations are considered TLAA. Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications provided the initial set of transients that were used in the design of the components and are included as part of each component analysis or stress report.

LRA Section 4.3.1, the applicant's TLAA assessment for metal fatigue of Class 1 RCPB components, states that metal fatigue analyses for RCPB components fit the 10 CFR 54.3 TLAA definition. The applicant provides the design-basis operational and transient categories that form the bases for the applicant's 40-year CUF value calculations in LRA Table 4.3-2, which includes the design-basis values for these transient categories and the applicant's projections of the number of cycles for these transients.

4.3.1.1 Reactor Vessel

4.3.1.1.1 Summary of Technical Information in the Application

LRA Section 4.3.1.1 summarizes the evaluation of the reactor vessel fatigue for the period of extended operation. The RPV was designed in accordance with ASME Code Section III. The required fatigue analyses were based on an allowed number of transient cycles. An evaluation of

fatigue usage factors in 2002 accounting for 60 years of operation projected that all vessel components would have fatigue usage factors below 1.0. Not all reactor vessel components have fatigue usage factors. Therefore, the RPV fatigue TLAA remains valid for the period of extended operation.

The applicant explained that the RPV, RPV supports, and RPV nozzle appurtenances were designed to the 1965 Edition of ASME Code Section III and that the original 40-year metal fatigue evaluations for these components were based on the methods for calculating CUFs in ASME Code Section III, Article NB-3000. The applicant added that the following RPV supports and RPV nozzle appurtenances were analyzed to these CUF requirements:

- RPV closure shell
- RPV shell - closure region
- RPV closure region bolts
- RPV shell other than the closure and bottom head region
- RPV bottom head dome including penetrations
- RPV support skirt
- RPV feedwater nozzle safe end
- RPV feedwater nozzle inner blend radius
- core spray nozzle
- control rod drive (CRD) hydraulic system return nozzle (cut and capped)
- recirculation inlet nozzle safe end
- recirculation inlet nozzle thermal sleeve
- recirculation outlet nozzle
- RPV vent nozzle
- RPV 6-inch instrument/head nozzle
- CRD penetration nozzle
- RPV shroud support and attachments
- RPV basin seal skirt

The CUF values for the RPV, RPV supports, and RPV nozzle components are in LRA Table 4.3-1. The applicant stated that the three most limiting commodity groups for metal fatigue of the RPV, RPV supports, and RPV nozzle appurtenance components are the “core shroud support and attachments,” “the vessel shell - other than the closure flange and bottom head regions,” and the “feedwater nozzle safe end.” The applicant specified CUF values of 0.90, 0.89, and 0.84 for these component locations, respectively.

The applicant stated that the CUF values for the RPV, RPV supports, and RPV nozzles in LRA Table 4.3-1 are bounding for the period of extended operation and that the TLAA on Class 1 metal fatigue is acceptable in accordance with 10 CFR 54.21(c)(1)(I). The applicant states that the Fatigue Monitoring Program will maintain CUF values for the RPV, RPV supports, and RPV nozzles for the period of extended operation.

4.3.1.1.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.1, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The scope of the CUF values in LRA Table 4.3-1 includes those for the RPV, RPV supports and RPV nozzle components listed in SER Section 4.3.1.1.1. For these components, the applicant concluded that the TLAA remains bounding for the period of extended operation and is acceptable in accordance with 10 CFR 54.21(c)(1)(i). The staff reviewed the TLAA bases documents for the validity of applicant's conclusion that the CUF values for the RPV, RPV supports and RPV nozzle components would remain bounding for the period of extended operation.

The LRA indicates that the three most limiting RPV components (including nozzles and supports) for fatigue are the RPV support skirt, RPV closure bolts (studs), and RPV feedwater (FW) nozzle safe end. The applicant reported 60-year CUF values of 0.90 for the RPV support skirt, 0.89 for the RPV shell (other than the closure flange and bottom head regions), and 0.834 for the RPV FW nozzle safe end.

The updated CUF calculations for the RPV components were based on the number of cycles for the design-basis transients in calculation No. SIR-02-045, Revision 1. The updated CUF values in SIR-02-045, Revision 1, for the RPV components were projected to be less than 1.0 with the exception of the following components: (1) RPV closure bolts (studs), (2) RPV FW nozzle thermal sleeve, and (3) RPV FW nozzle inner blend radius. The applicant reanalyzed the CUF values for these three component locations in Minor Calculation Change No. DRN-03-00794.

The staff reviewed Minor Calculation Change No. DRN-03-00794 for whether the revised CUF calculations for the RPV closure studs, RPV FW nozzle thermal sleeve, and RPV FW nozzle inner blend radius were in accordance with design-basis requirements and whether the CUF value revisions for these components were acceptable. Based on its review of these calculations, the staff determined that the CUF values for these components reported in LRA Table 4.3-1 were in accordance with ASME Code Section III and the requirements of updated design-basis transient cycles.

The staff asked the applicant to clarify whether the RPV FW nozzle is subject to the leakage bypass transients described in NUREG-0619 and, if so, whether the CUF calculation in Minor Calculation Change No. DRN-03-00794 for this component accounts for this type of operational transient.

In its response, the applicant stated that the FW nozzle area is subject to the bypass leakage transients described in NUREG-0619 and that the updated CUF values for the RPV FW nozzle inner blend radius include a rapid-cycle fatigue calculation to account for rapid leakage cycling past the thermal sleeve of the nozzle. The staff confirmed that the CUF calculations for the FW nozzle include a rapid-cycle fatigue calculation for the FW nozzle inner blend radius and that the proper value for the FW nozzle is reflected in LRA Table 4.3-1. The staff also confirmed that the updated CUF values for the remaining RPV components, RPV nozzles, and RPV support components in these calculations are reflected appropriately in LRA Table 4.3-1.

Based on its review of the information in LRA Tables 4.3-1 and 4.3-2 and of the calculations in SIR-02-045, Revision 1, and Minor Calculation Change No. DRN-03-00794, the staff concluded that the updated CUF calculations in LRA Table 4.3-1 are valid for the period of extended operation if the applicant demonstrates that the 60-year cycle projections for the plant's transients would be bounded by the updated design-basis cycle numbers for the transients.

In RAI 4.3.1-1 dated February 23, 2007, the staff asked the applicant to clarify (1) the projected 60-year cycle numbers for the design-basis transients, (2) how the 60-year projections for these transients were calculated as based on past cycle counting, and (3) why the 60-year cycle projections for the design-basis transients in LRA Table 4.3-2 are valid.

In its letter dated June 20, 2007 (ML071770168), the applicant amended the LRA and provided its response to RAI 4.3.1-1 on cycle projections. Specifically, the applicant amended the LRA to update the 60-year cycle projections for the design basis transients based on plant operational data since initial startup of the facility. The applicant also provided Report No. SIR-07-084, Revision 1, "SI Response to NRC Requests for Additional Information for FitzPatrick [June 8, 2007]," in its letter of June 20, 2007.

The staff reviewed Report No. SIR-07-084, Revision 1, and determined that the applicant has reanalyzed and categorized those undefined operational transients that had been analyzed in earlier design basis CUF calculations. The applicant also updated the 60-year cycle projections for the following design basis transients:

- Category No. 3, "Startups," from 216 to 242
- Category No. 11, "Loss of FW Pumps, SIVs Close," from 10 to 11
- Category No. 15, "All Other SCRAMs," from 62 to 57
- Category Nos. 19-23, "Shutdowns," from 244 to 270

The startup and shutdown categories are the transients categories contribute the most to the CUF calculations. The staff determined that the changes in the 60-year projections for these categories amounts to a 10-12.5 percent increase in 60-year cycle projections for these categories. The staff determined that the information provided in its response to RAI 4.3.1-1 and Amendment 12 dated June 20, 2007, provides acceptable 60-year cycle projections for these design transient categories.

The applicant amended its basis for accepting the TLAA from acceptance in accordance with 10 CFR 54.21(c)(1)(i) (i.e., the analysis remains valid for the period of extended operation) to acceptance in accordance with 10 CFR 54.21(c)(1)(iii) (i.e., the effects of aging on the intended function(s) will be adequately managed for the period of extended operation). The staff concludes that this is acceptable because the applicant will use its Fatigue Monitoring Program to assure that the number of cycles recorded for the operational transients to date will remain below their design-basis allowables and to ensure that the effects of thermal fatigue on the intended function for these components will be managed for the period of extended operation, as accepted in accordance with the requirements of 10 CFR 54.21(c)(1)(iii). This is in conformance with the staff's position in GALL aging management program (AMP) X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary," for accepting metal fatigue evaluations in accordance with the criteria of 10 CFR 54.21(c)(1)(iii).

The applicant's Fatigue Monitoring Program is described and discussed in LRA Section B.1.12. The staff evaluated the ability of the Fatigue Monitoring Program to manage the effects of thermal fatigue on the intended functions of the RPV components in SER Section 3.0.3.2.10. Based on this assessment, the staff concludes that the applicant has provided a valid basis for concluding that the TLAA on metal fatigue of the RPV components is acceptable. RAI 4.3.1-1 is resolved.

4.3.1.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of reactor vessel fatigue in LRA Section A.2.2.2.1 and in its letter dated June 20, 2007 (Amendment 12). On the basis of its review of the UFSAR, the staff finds that the summary description of the applicant's actions to address reactor vessel fatigue is adequate.

4.3.1.1.4 Conclusion

On the basis of its review, as discussed above for reactor vessel fatigue, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the effects of aging on the intended functions will be adequately managed for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.2 Reactor Vessel Internals

4.3.1.2.1 Summary of Technical Information in the Application

LRA Section 4.3.1.2 summarizes the evaluation of reactor vessel internals fatigue for the period of extended operation. Although not mandatory, the design of the reactor vessel internals is in accordance with the intent of ASME Code Section III. A fatigue analysis of the internals determined that maximum fatigue usage occurs in the jet pump-shroud-shroud support area at the ID of the jet pump diffuser adapter at the thin end of the tapered transition section. The maximum 0.65 CUF in this area for 40 years of operation is projected to 60 years of operation by multiplying by 1.5 for a 0.98 CUF for the ID of the jet pump diffuser at transition. There was also a fatigue evaluation on the tie rod assemblies installed as part of the core shroud repair. The maximum CUF for the tie rod components is 0.0575 for the spring rod based on 120 startups/shutdowns. The current number of startups/shutdowns allowed for 60 years of operation is 233. Therefore, a conservative projection of the fatigue usage of the tie rods for 60 years of operation would be (233/120) x 0.0575, which equals a CUF of 11. The analyses for the jet pump diffuser at transition and the shroud tie rod assembly have been projected through the period of extended operation.

4.3.1.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.2, to verify pursuant to 10 CFR 54.21(c)(1)(ii), that the analyses have been projected to the end of the period of extended operation.

The applicant stated that the jet pump diffuser adapters and core shroud tie rod assemblies were the only RPV internal components that had undergone design-basis CUF analyses for the CLB.

The LRA indicates that the CUF value for the jet pump diffuser adapters will be 0.98 at 60 years of licensed operation. The staff noted that the period of extended operation will add 20 years to the facility's 40-year licensed life; thus, a safety factor of 1.5 (*i.e.*, by a factor = [1 + (20 years /40 years)]) is the minimum that must be applied to the 40-year jet pump diffuser adapter CUF value to account for the period of extended operation. The adequacy of this method of analysis for projecting the CUF values to 60 years is acceptable only if the method for projecting the cycle

numbers for the design-basis transients to 60 years is acceptable and if the 60-year cycle projections are demonstrably lower than those for the cycles for the design-basis transients. As noted previously, the staff asked the applicant in RAI 4.3.1-1 to address this issue; thus, the staff’s determination of whether the CUF is valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii) remains open pending resolution of RAI 4.3.1-1.

In its letter dated June 20, 2007 (ML071770168), the applicant amended the LRA and provided its response to RAI 4.3.1-1 on cycle projections. Specifically, the applicant amended the LRA to update the 60-year cycle projections for the design basis transients based on plant operational data since initial startup of the facility. The applicant also provided Report No. SIR-07-084, Revision 1, "SI Response to NRC Requests for Additional Information for FitzPatrick [June 8, 2007]," in its letter of June 20, 2007.

The staff reviewed Report No. SIR-07-084, Revision 1, and has documented its evaluation of this report in SER Section 4.3.1.1.2. The staff determined that the updated 60-year cycle projection for the design basis transients are bounded by the number of cycles assumed for in the applicant's 60-year CUF calculations for the jet pump diffuser assembly adapters and the core shroud tie rod assemblies. Based on this assessment, the staff concludes that the applicant has provided an acceptable basis for projecting the CUF values for these components to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). In addition, the applicant will use its Fatigue Monitoring Program to assure that the number of cycles recorded for the operational transients to date will remain below their design basis allowables and to ensure that the effects of thermal fatigue on the intended function for these components will be managed for the period of extended operation, as accepted in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

This is in conformance with the staff's position in GALL AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary," for accepting metal fatigue evaluations in accordance with the criteria of 10 CFR 54.21(c)(1)(iii). The applicant's Fatigue Monitoring Program is described and discussed in LRA Section B.1.12. The staff evaluated the ability of the Fatigue Monitoring Program to manage the effects of thermal fatigue on the intended functions of the RPV components in SER Section 3.0.3.2.10. Based on this assessment, the staff concludes that the applicant has provided a valid basis for concluding that the TLAA on metal fatigue of the RPV components is acceptable. RAI 4.3.1-1 is resolved.

4.3.1.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of reactor vessel internals fatigue in LRA Section A.2.2.2.1 and in its letter dated June 20, 2007 (Amendment 12). On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address reactor vessel internals fatigue is adequate.

4.3.1.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated for reactor vessel internals fatigue, that pursuant to 10 CFR 54.21(c)(1)(ii), the analyses have been projected to the end of the period of extended operation, or that pursuant to 10 CFR 54.21(c)(1)(iii), the effects of aging on the intended functions will be adequately managed

for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.1.3 Class 1 Piping and Components

4.3.1.3.1 Summary of Technical Information in the Application

LRA Section 4.3.1.3 summarizes the evaluation of Class 1 piping and components for the period of extended operation. All RCS pressure boundary piping is designed and analyzed in accordance with ANSI B31.1. The ANSI B31.1 code addresses fatigue by using stress range reduction factors to reduce stress allowable. Components with less than 7000 equivalent full-temperature cycles are limited to the calculated stress allowable without reduction per ANSI B31.1.0. Components that exceed 7000 equivalent full-temperature cycles have allowable stresses reduced through the application of stress range reduction factors. As the reactor coolant pressure boundary will not exceed 7000 full temperature cycles in 60 years of operation, existing stress analyses remain valid for the period of extended operation.

4.3.1.3.2 Staff Evaluation

The staff reviewed LRA Section 4.3.1.3, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

The applicant’s Class 1 piping components were all designed to ANSI B31.1 design code. The ANSI B31.1 requires that the maximum allowable stress range be reduced if the projected number of full thermal transients on the components is greater than 7000 cycles. The applicant indicated that the total number of full thermal cycle transients projected through 60 years of operation is less than 7000 and that, based on this projection, the analyses for these components remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The staff reviewed the thermal transients defined and summarized in LRA Table 4.3-2 and confirmed that the total number of full thermal transients projected to the end of the period of extended operation (*i.e.*, through 60 years of licensed power operations) will be fewer than 7000. Based on this confirmation, the staff concludes that the applicant has provided an acceptable basis for the conclusion that the maximum allowable stress range analysis for the ASME B31.1 Class 1 piping components remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.1.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of Class 1 piping and components fatigue in LRA Section A.2.2.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address Class 1 piping and components fatigue is adequate.

4.3.1.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for Class 1 piping and components

fatigue, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.2 Non-Class 1 Fatigue

4.3.2.1 Summary of Technical Information in the Application

LRA Section 4.3.2 summarizes the evaluation of non-Class 1 fatigue for the period of extended operation. The design of ASME Code Section III Code Classes 2 and 3 piping systems incorporates the code stress reduction factor for determining acceptability of piping design for thermal stresses. In general, 7000 thermal cycles are assumed, allowing a stress reduction factor of 1.0 in the stress analyses. The applicant's evaluation of the validity of this assumption for 60 years of plant operation indicates that the assumption is valid and bounding. Therefore, the pipe stress calculations are valid for the period of extended operation. Non-Class 1 components, other than piping system components, require fatigue analyses only if built in accordance with ASME Section III, NC-3200 or ASME Section VIII, Division 2. The applicant has no non-Class 1 components built to these codes and therefore no TLAA for other than piping system components.

4.3.2.2 Staff Evaluation

The staff reviewed LRA Section 4.3.2, 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 and review, the staff reviewed LRA Section 4.3.2 on the TLAA on metal fatigue for non-Class 1 components and plant design-basis documents. The staff determined that the current ISI program indicates that the ASME Code Classes 2 and 3 piping systems are designed in accordance with the ANSI B31.1 1967 Edition. The staff noted that the plant design-basis document indicated the total number of full thermal cycles projected for non-Class 1 components through 60 years of licensed operations is less than 7000 cycles. Based on this number, the staff concludes that the stress calculations for the non-Class 1 piping will remain valid for the period of extended operation.

4.3.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of non-Class 1 fatigue in LRA Section A.2.2.2.2 explaining how the number of full thermal transients is projected to remain below 7000 cycles at the expiration of the period of extended operation and, therefore, providing an acceptable description of the TLAA on metal fatigue for non-Class 1 components in that it shows how the maximum allowable stress range analysis for the components remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i). On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address non-Class 1 fatigue is adequate.

4.3.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for non-Class 1 fatigue, the analyses remain valid for the period of extended operation. In addition, the staff concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.3.3 Effects of Reactor Water Environment on Fatigue Life

In Generic Safety Issue (GSI)-190, "Fatigue Evaluation of Metal Components for 60-year Plant Life," the staff assessed the generic effects of reactor coolant environment on fatigue life of Class 1 components. In accordance with interim staff guidance document ISG-16, "Time-Limited Aging Analyses (TLAAs) Supporting Information for License Renewal Applications," the staff position is that the environmental effects of the reactor coolant environments must be evaluated for their impacts on the 60-year metal fatigue CUF values for high-fatigue CUF locations listed in vintage BWR plants.

4.3.3.1 Summary of Technical Information in the Application

LRA Section 4.3.3 summarizes the evaluation of effects of reactor water environment on fatigue life for the period of extended operation. NUREG/CR-6260 applied fatigue design curves for environmental effects on several plants and NUREG/CR-6260 Section 5.7 identified the following component locations as most sensitive to environmental effects for General Electric plants similar to JAFNPP. These locations and the corresponding calculations are directly relevant:

- reactor vessel shell and lower head
- reactor vessel FW nozzles
- RR piping (including inlet and outlet nozzles)
- core spray line reactor vessel nozzle and associated piping
- residual heat removal (RHR) return piping
- FW piping

The applicant evaluated the limiting locations using the guidance of Volume 2, Section X.M1 of NUREG-1801, Revision 1, "Generic Aging Lessons Learned (GALL) Report," dated September 2005, and the fatigue life correction factors, Fen, reported in NUREG/CR-5704 and NUREG/CR-6583. Four of nine components reviewed at these locations have environmentally-adjusted CUFs greater than 1.0. Prior to the period of extended operation, for each location with a CUF that may exceed 1.0 the applicant will implement one or more of the following: (1) further refinement of the fatigue analyses to lower the predicted CUFs to less than 1.0 using an NRC-approved method; (2) management of fatigue at the affected locations by an inspection program reviewed and approved by the staff (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by an acceptable method); or (3) repair or replacement of the affected locations. If the applicant opts to manage environmentally-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted prior to the period of extended operation. The effects of environmentally-assisted thermal fatigue for the limiting locations identified in NUREG-6260 have been evaluated. Depending on the option

chosen, which may vary by component, this TLAA will be projected through the period of extended operation or the effects of environmentally-assisted fatigue will be managed. For those locations with CUFs less than 1.0, the TLAA has been projected through 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 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.

In NUREG/CR-6260, the staff evaluated a sample of RCS components for the impacts of the reactor coolant environment on their thermal fatigue analyses. The applicant selected the following BWR RCS component locations listed in NUREG/CR-6260 to evaluate the impact of the reactor coolant environment on their thermal fatigue analyses:

- RPV shell and lower head
- RPV FW nozzles
- RR piping (including inlet and outlet nozzles)
- core spray line nozzle to the RPV and associated piping
- RHR return line piping
- FW piping

The applicant stated that, of the locations listed for a similar vintage BWR in NUREG/CR-6260, it had updated 60-year CUF calculations for the RPV shell, RPV bottom head, RPV FW nozzle safe end, RPV recirculation inlet nozzle thermal sleeve, RPV recirculation outlet nozzle, and RPV core spray nozzles.

The applicant made environmental adjustments of CUF values by multiplying the 60-year CUF values for the specific component locations (as listed in LRA Table 4.3-1) by the appropriate fatigue life correction factor (F_{en}) value derived from NUREG/CR-6583 if the specific component was fabricated from carbon or low-alloy steel or from NUREG/CR-5704 if fabricated from austenitic stainless steel. The applicant provided in its design-basis document bases for the calculations of the F_{en} adjustment factors.

The staff determined that in 1988 the applicant had changed its basis for controlling the chemistry of the reactor coolant from normal water chemistry (NWC) to hydrogen water chemistry (HWC) procedural controls. The change from NWC to HWC procedural controls significantly changes the concentration of dissolved oxygen in the reactor coolant. During the audit and review, the staff reviewed the applicant's design-basis document and determined that the environmental adjustments of the CUF values were based on oxygen concentration values for HWC implementation at the facility. This determination assumes that the facility had been operating under HWC conditions since initial commercial operation of the plant on July 28, 1975.

During the audit and review, the staff asked the applicant to clarify whether it had factored the actual NWC oxygen concentrations into the F_{en} calculations for the period from initial plant operation to 1988, when the plant started to implement NWC procedures.

In its letter dated February 1, 2001 (ML0704401270), the applicant indicated that it will recalculate the F_{en} values to account for the oxygen concentrations when the plant implemented NWC and HWC procedures and apply the revised F_{en} values to the CUF values in LRA Table 4.3-3. The applicant included this process as part of Commitment No. 20, which was included in LRA Amendment 5 dated February 1, 2007, and resubmitted in LRA Amendment 9, dated April 6, 2007 (ML0710603900).

The staff noted that the revised environmentally-adjusted CUF values for the RPV shell, RPV FW nozzle safe end, RPV recirculation inlet nozzle thermal sleeve, and RPV recirculation outlet nozzle were projected to be above 1.0 for the period of extended operation. To address this issue, in its letters dated February 1, and April 6, 2007, the applicant amended the LRA to include Commitment No. 20 as follows:

> At least 2 years prior to entering the period of extended operation, for the locations identified in NUREG/CR-6260 for BWRs of the JAFNPP vintage, JAFNPP will implement one or more of the following:
>
> (1) Refine the fatigue analyses or develop new analyses (Class 1 RHR piping and Class1 feedwater piping locations), if necessary, to determine valid CUFs less than 1 when accounting for the effects of reactor water environment. This includes applying the appropriate F_{en} factors to valid CUFs determined in accordance with one of the following:
>
> > 1. For locations with existing fatigue analysis valid for the period of extended operation, use the existing CUF to determine the environmentally adjusted CUF.
> >
> > 2. More limiting JAFNPP-specific locations with a valid CUF may be added to the NUREG/CR-6260 locations.
> >
> > 3. Representative CUF values from other plants, adjusted to or enveloping the JAFNPP plant specific external loads may be used if demonstrated applicable to JAFNPP.
> >
> > 4. For locations, including NUREG/CR-6260 locations, an analysis using the NRC-approved version of the ASME code in the 2001 Edition up to an inclusive of the 2003 Addenda may be performed to determine a valid CUF.
>
> The determination of F_{en} will account for operating time with normal water chemistry and operating time with hydrogen water chemistry.
>
> (2) Manage the effects of aging due to fatigue at affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic nondestructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC).
>
> (3) Repair or replace the affected locations prior to the period of extended operation and the location exceeding a CUF of 1.0.

> Should JAFNPP select the option to manage the aging effects due to environmental-assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.

The staff noted that under Commitment No. 20 the applicant must either (1) redo the 60-year environmentally-adjusted CUF calculations for the Class 1 locations in LRA Table 4.3-3, including new environmental CUF calculations for the Class 1 portions of the RHR and FW piping, (2) manage the aging effects due to fatigue by using an NRC-approved AMP to inspect these component locations prior to the period of extended operation, or (3) repair or replace the affected components before exceeding a environmentally-adjusted CUF value of 1.0. If using the first option as the basis for acceptance of the TLAA on environmental fatigue, the applicant will submit the results of the environmentally-adjusted CUF calculations for review and approval at least two years prior to the period of extended operation.

The staff concludes that the Fatigue Monitoring Program, when supplemented by Commitment No. 20 provides an acceptable basis for managing the impact of the RCS environment on the Class 1 fatigue calculations, as evaluated in accordance with 10 CFR 54.21(c)(1), because the applicant either (1) will recalculate new 60-year, environmentally-adjusted CUF values to confirm whether the revised environmentally-adjusted CUFs are less than 1.0 or (2) will manage the effects of fatigue on the components by inspecting for fatigue-induced cracking with a staff-approved AMP, or (3) will repair or replace the components prior to the period of extended operation.

In LRA Amendment No. 12, June 20, 2007 (ML071770168), the applicant amended the LRA to change the basis for accepting this TLAA in accordance with the criteria of 10 CFR 54.21(c)(1)(iii).

By letter dated July 25, 2007 (ML072010267), the staff sought further clarifications on the options that could be used under LRA Commitment No. 20 and issued RAI 4.3.3-1 to address this issue. In RAI 4.3.3-1, the staff asked the applicant to identify which option or options under LRA Commitment No. 20 would be used to satisfy the commitment when implemented and, for each option selected to meet the commitment, to provide a sufficient detailed description of the methodology that would be used to satisfy the option. The staff informed the applicant that the information requested in the RAI was necessary in order for the staff to make a determination on the acceptability of the applicant's TLAA on environmentally-assisted fatigue. The staff therefore requested that the information in the response to RAI 4.3.3-1 be submitted as an amendment of the LRA. The specific details of RAI 4.3.3-1 are attached to the above letter (ADAMS Accession No. ML072010267).

The staff's determination on the acceptability of the TLAA on environmentally-assisted fatigue is pending submittal of the applicant's response to RAI 4.3.3-1 and the staff's review of the response to this RAI. **This is Open Item 4.3.3-1.**

4.3.3.3 UFSAR Supplement

The applicant provided a UFSAR Supplement summary description of its TLAA evaluation of effects of reactor water environment on fatigue life in LRA Section A.2.2.2.3. The staff has determined that the UFSAR Supplement summary description in LRA Section A.2.2.2.3 adequately summarizes the options relied on for TLAA acceptance and that Commitment No. 20 appropriately applies to the assessment in LRA Section 4.3.3 and to the UFSAR Supplement summary description in LRA Section A.2.2.2.3 and LRA Amendment No. 12. On the basis of its review of the UFSAR supplement, pending the resolution of RAI 4.3.3-1/Open Item 4.3.3-1, the staff concludes that the summary description of the applicant's actions to address effects of reactor water environment on fatigue life is adequate.

4.3.3.4 Conclusion

On the basis of its review, as discussed above, pending acceptable resolution of RAI 4.3.3-1/Open Item 4.3.3-1, the staff concludes that the applicant has committed to further activities to ensure that, 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. Pending acceptable resolution of RAI 4.3.3-1/Open Item 4.3.3-1, the staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.4 Environmental Qualification of Electric Equipment

The 10 CFR 50.49 environmental qualification (EQ) program is a TLAA for purposes of license renewal. The TLAA of the EQ electrical components includes all long-lived, passive, and active electrical and I&C components that are important to safety and located in a harsh environment. The harsh environments of the plant are those areas subject to environmental effects by loss of coolant accidents or high-energy line breaks. EQ equipment comprises safety-related and Q-list equipment, nonsafety-related equipment the failure of which could prevent satisfactory accomplishment of any safety-related function, and necessary post-accident monitoring equipment.

As required by 10 CFR 54.21(c)(1), the applicant must provide a list of EQ TLAAs in the LRA. The applicant shall demonstrate that for each type of EQ equipment one of the following is true: (1) the analyses remain valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

4.4.1 Summary of Technical Information in the Application

LRA Section 4.4 summarizes the evaluation of EQ of electric equipment for the period of extended operation. The Environmental Qualification of Electric Components Program manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term will be refurbished or replaced or their qualification will be extended before they reach the aging limits established in the evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are

considered TLAAs for license renewal. The existing EQ program that maintains these EQ components in accordance with their qualification bases was established to meet commitments for 10 CFR 50.49. Consistent with GALL Report Section X.E1, "Environmental Qualification (EQ) of Electric Components," the program includes consideration of operating experience to modify qualification bases and conclusions, including qualified life. Compliance with 10 CFR 50.49 provides reasonable assurance that components can perform their intended function(s) during accident conditions with the effects of inservice aging. Consistent with NRC guidance in RIS 2003-09, no additional information is required to address GSI 168, "EQ of Electrical Components." Review of the existing program and operating experience shows that continued implementation of the Environmental Qualification of Electrical Components Program provides reasonable assurance that the aging effects will be managed and that the in-scope EQ components will continue to perform their intended function(s) 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.

The staff reviewed LRA Section 4.4 and the plant-basis document to determine whether the applicant's information was adequate under 10 CFR 54.21(c)(1). For the electrical equipment in the basis document, the applicant uses the 10 CFR 54.21(c)(1)(iii) TLAA evaluation to demonstrate that the aging effects of EQ equipment will be adequately managed during the period of extended operation. The staff reviewed the EQ Program to determine whether the electrical and instrumentation and control (I&C) components covered under this program will continue to perform intended functions consistent with the CLB for the period of extended operation. The staff's evaluation of component qualification focused on how the EQ Program manages the aging effects to meet the 10 CFR 50.49 requirements.

The staff audited the information in LRA Section B.1.10 and program-bases documents available at the applicant's engineering office. On the basis of its audit, the staff finds that the EQ Program, for which the applicant claimed consistency with GALL AMP X.E1, "Environment Qualification of Electrical Components," is consistent. Therefore, the staff finds that the EQ Program can programmatically manage the qualified life of components within the scope of license renewal. The EQ Program reasonably assures management of aging effects so components within its scope will continue to perform intended functions for the period of extended operation.

4.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of environmental qualification of electric equipment in LRA Section A.2.2.3. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address environmental qualification of electric equipment is adequate.

4.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(iii), that, for environmental qualification of electric 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 UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.5 Concrete Containment Tendon Prestress

4.5.1 Summary of Technical Information in the Application

LRA Section 4.5 states that evaluation of concrete containment tendon prestress is not applicable because there are no pre-stressed tendons in the containment building.

4.5.2 Staff Evaluation

The containment has no prestressed tendons; therefore, the staff finds this TLAA not required.

4.5.3 UFSAR Supplement

The staff concludes that no UFSAR supplement is required because JAFNPP has no pre-stressed tendons in the containment building.

4.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that this TLAA is not required.

4.6 Containment Liner Plate, Metal Containment, and Penetrations Fatigue Analysis

JAFNPP is a BWR with a Mark I containment consisting of a freestanding steel drywell, vent system, and steel pressure suppression chamber (torus). Large-scale testing of the Mark III containment and in-plant testing of Mark I primary containment systems found additional hydrodynamic loads not considered in the original containment design. The Mark I Owners group initiated the Mark I Containment Program to develop a generic load definition and structural analysis techniques. The staff evaluation of the generic load definition and structural assessment techniques is in NUREG-0661, “ Safety Evaluation Report, Mark I Containment Long-Term Program, Resolution of Generic Technical Activity A-7,” dated July 1980. The Mark I Containment Long-Term Program evaluation included fatigue analyses of the torus, the discharge piping system, and attached piping.

4.6.1 Fatigue of Primary Containment

4.6.1.1 Summary of Technical Information in the Application

LRA Section 4.6.1 summarizes the evaluation of primary containment fatigue for the period of extended operation. Analysis of the containment as part of the Mark I containment long-term

program was by methods and assumptions consistent with NUREG-0661. The Mark I containment long-term program analyzed the torus and attached piping systems for fatigue due to mechanical loadings as well as thermal and anchor motion. This analysis was based on assumptions of the number of safety relief/valve actuations, operating basis earthquakes, and accident conditions during the life of the plant. The analysis considered all BWR plants utilizing the Mark I containment design and concluded that for all plants and piping systems considered, the fatigue usage factor for an assumed 40-year plant life was less than 0.5. Extending plant life by an additional 20 years would produce a usage factor below 0.75, less than 1.0, so the fatigue criteria are satisfied. This TLAA has been projected through the period of extended operation.

4.6.1.2 Staff Evaluation

The staff reviewed LRA Section 4.6.1, 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 review of the Standard Review Plan (SRP) Section 4.6.1 evaluation of the containment liner plates, metal containment, and penetrations sleeves found that the applicant’s code of record requires a fatigue analysis for the torus and attached piping systems from mechanical loadings as well as thermal and anchor motion, and for this reason the staff reviewed the torus and attached piping system fatigue evaluation for the period of extended operation as required by 10 CFR 54.21(c). During the audit and review, the staff asked the applicant for an estimate of the total number of 60-year Safety Relief Valve (SRV) actuations in the design fatigue evaluation.

In its response, the applicant stated that all domestic Mark I BWRs appear to meet the GE Mark I Containment Program (MPR-751) (Augmented Class 2/3 Fatigue Evaluation Method and Results for Typical Torus Attached and SRV Piping Systems, November 1982) for both the current operating license period and the period of extended operation. The applicant has tracked SRV actuations from October 1974 to November 4, 2006, and recorded a total of 564 representing approximately 32 years of operation. Conservatively assuming each of the 11 valves has lifted on every actuation, the estimated number of lifts for each valve for 60 years is (60/32) × 564 = 1058 actuations in 60 years.

The plant-specific analysis (Teledyne Engineering Services (TES) document TR-5321-2) stated that the SRV penetrations are qualified for 7500 cycles of maximum load. On this basis, the projected CUF for 60 years is 0.141.

The staff also asked the applicant for a fatigue evaluation of the SRV discharge and other attached piping. The applicant’s response referred to the plant-specific stress analysis (TR-5321-2) for various load combinations; however, it does not include a fatigue evaluation of all of the other torus attached piping (TAP). TAP is bounded by the GE Mark I Containment Program, which considered fatigue usage factors less than 0.5 for an assumed 40-year plant life for all piping systems. The staff noted that an additional 20 years of plant life would indicate usage factors below 0.75, less than 1.0, satisfying the fatigue criterion. The staff concludes that the applicant’s evaluation adequately demonstrated that fatigue usage will not exceed its allowable limit during the period of extended operation. Therefore, the staff finds that the applicant has projected the TAP analysis for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

The applicant also stated that the plant-specific analysis (TR-5321-2) addresses the SRV discharge piping and its supports as well as the main vent penetration through which the SRV discharge enters the torus. This analysis states that the SRV penetrations are qualified for 7500 cycles of maximum load with fewer than 50 cycles at maximum load and 4500 cycles at partial load expected for the SRVs. The analysis concludes, "Since the 7500 cycles of maximum loads bounds both of these by such a large margin and since no other significant loads are imposed on the line, the penetration was determined to be acceptable for fatigue without further evaluation." The 40-year cycles increased by 1.5 for the period of extend operation would be only 75 maximum-load and 6750 low-load cycles for a total of 6825 mixed-load cycles, fewer than the 7500 maximum load cycles permitted. The staff finds that the fatigue analysis for torus penetrations thus remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

The applicant also indicated that the plant-specific analysis (TR-5321-2) refers to the generic GE Mark I Containment Program for other TAP. The results of that program (based on 40 years of operation) were that 92 percent of the TAP would have CUFs less than 0.3 and 100 percent less than 0.5. These CUFs conservatively multiplied by 1.5 show that for 60 years of operation, 92 percent of the TAP would have CUFs below 0.45 and 100 percent below 0.75. These calculations thus have been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii). The staff reviewed the applicant's response and finds it acceptable because it reasonably summarizes the information presented in LRA Section 4.6.1.

4.6.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of primary containment fatigue in LRA Section A.2.2.4. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address primary containment fatigue is adequate.

4.6.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that, for primary containment fatigue, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7 Other Plant-Specific TLAAs

LRA Section 4.7 summarizes the evaluation of the following plant-specific TLAAs:

- recirculation isolation valves
- leak-before-break
- TLAA in BWRVIP documents

4.7.1 Recirculation Isolation Valves

4.7.1.1 Summary of Technical Information in the Application

LRA Section 4.7.1 summarizes the evaluation of recirculation isolation valves for the period of extended operation. In reference to the recirculation isolation valves, the UFSAR states, "For fatigue evaluations consider 30 cycles of normal pressurization followed by blowdown and 270 cycles of normal pressurization followed by normal depressurization." LRA Section 4.7.1 states that "As these are not ASME-class valves, no specific fatigue analysis was required; however, the number of cycles suggested by the UFSAR is greater than the number of cycles allowed as part of the Fatigue Monitoring Program, so the transients suggested will not be exceeded. Thus this TLAA will remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i)."

4.7.1.2 Staff Evaluation

The staff reviewed LRA Section 4.7.1, pursuant to 10 CFR 54.21(c)(1)(i), to verify that the analyses remain valid for the period of extended operation.

The applicant dispositioned this TLAA under 10 CFR 54.21(c)(1)(i) and provided a UFSAR Supplement summary accordingly.

Under the 10 CFR 54.21(c)(1)(i) disposition option, the applicant must demonstrate that "The analyses remain valid for the period of extended operation."

The applicant in its TLAA quotes the UFSAR: "For fatigue evaluations consider 30 cycles of normal pressurization followed by blowdown and 270 cycles of normal pressurization followed by normal depressurization." The applicant further states that these are not ASME valves and that no specific fatigue analysis was required. The staff notes that UFSAR Section 4.3.4 states that "The Reactor Recirculation System is designed and constructed to meet the requirements described in Section 16.2." Section 16.2.3.4, "Piping," states that:

> The piping systems were designed in accordance with ANSI B31.1.0 and no formal fatigue analysis was required. It was, therefore, not required to categorize the design transients or combination of transients which were included in each loading conditions and the number of design cycles for each transient or combination of transients. No such categorization was made for the safety/relief valves, main steam line isolation valves, recirculation system valves and pumps, or other components in the Reactor Coolant Pressure Boundary because the applicable codes did not require such categorization.

The staff further notes that, in reference to the 28-inch suction and discharge recirculation valves, UFSAR Table 16.2-7, under the first column titled "Criteria-Method" specifies the following:

> ASME Boiler and Pressure Vessel Code, Nuclear Vessels Section III Article 4

In the second column, titled "Method of Analysis," UFSAR Table 16.2-7 specifies the following:

For fatigue evaluations consider 30 cycles of normal pressurization followed by blowdown and 270 cycles of normal pressurization followed by normal depressurization. Plot results.

In the third column, titled “Allowable Stress or Minimum Required Dimension,” UFSAR Table 16.2-7 specifies the following requirement:

Plotted results show that the flange region of the valve is adequate for the defined service.

In RAI 4.7-1 dated January 12, 2007, the staff requested from the applicant information as described in 10 CFR 54.21(c)(1)(i).

In its response dated February 12, as supplemented April 6, 2007, the applicant stated that it could not identify a fatigue evaluation for these valves. It is the applicant’s stated opinion that contents of UFSAR Table 16.2-7, in reference to these valves, are merely for guidance as to what cycles to include if the analysis is performed. The applicant further stated that it had evaluated the number of cycles listed in UFSAR Table 16.2-7 conservatively as if they had been used in a fatigue analysis and that if a fatigue analysis was done, it will remain valid for the period of extended operation (thus fulfilling Criterion (i)) because the number of cycles specified in Table 16.2-7 is greater than the number monitored and allowed by the Fatigue Monitoring Program (FMP). In response to the staff’s RAI, the applicant indicated that the FMP monitored and allowed values are in LRA Table 4.3-2. This table is subject to RAI 4.3.1-1. On June 20, 2007 the applicant submitted Amendment 12 of its LRA (ADAMS accession number ML071770168) which includes supplemental response to RAI 4.3.1-1. Attachment 1 Table C-2 of LRA Amendment 12 contains the current design basis allowable cycles as listed in UFSAR Table 4.2-3 and updates the 60-year cycle projections of LRA Table 4.3-2. The following transient cycle values are included in Table C-2.

Startups
Current Design Basis = 233
60-year projection = 242

Single Relief Valve Blowdown
Current Design Basis = 2
60-year projection = 1

Shutdowns
Current Design Basis = 233
60-year projection = 270

By comparison, the staff notes that these values are enveloped by the cycle values specified in UFSAR Table 16.2-7 (see above) for the Recirculation Isolation Valves. Therefore, the staff concurs with the applicant that, if there is a fatigue analysis reflected by UFSAR Table 16.2-7, the applicant has demonstrated in accordance with 10 CFR 54.21(c)(1)(i) that the analysis will remain valid for the period of extended operation.

4.7.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of recirculation isolation valves in LRA Section A.2.2.5. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address recirculation isolation valves is adequate.

4.7.1.4 Conclusion

On the basis of its review for the recirculation isolation valves, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that, for recirculation isolation valves, the analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.2 Fatigue Crack Growth Analysis for UFSAR Section 16.3.2.2

4.7.2.1 Summary of Technical Information in the Application

LRA Section 4.7.2, as amended by letter dated April 6, 2007, summarizes the evaluation of a fatigue crack growth analysis in UFSAR Section 16.3.2.2 for the period of extended operation. Specifically, the section describes an evaluation of the necessity of pipe whip restraints the installation of which could affect plant safety adverse by hindering ISIs. Part of the evaluation calculates the growth of a crack prior to sudden rupture using a fatigue analysis to predict the propagation of cracks that originate at defects permitted by the ANSI B31.7 Code. UFSAR Section 16.3.2.2 concludes that for cyclic stress equal to the design yield strength with defect sizes permitted by the code, the fatigue life of each pipe line is greater than 100,000 transient cycles. While the applicant believes the 100,000 transient cycles is not a time-limited assumption defined by the current operating term, it has chosen to evaluate the analysis conservatively as a TLAA.

As shown in LRA Table 4.3-2, no transients are projected to exceed 100,000 cycles during 60 years of operation. Because transient cycles will not exceed 100,000 cycles in 60 years of operation, the fatigue crack growth analysis in UFSAR 16.3.2.2 remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2.2 Staff Evaluation

The staff reviewed LRA Section 4.7.2, as amended by letter dated April 6, 2007, to verify that it is in accordance with 10 CFR 54.21(c)(1)(i), and that the analysis remains valid for the period of extended operation.

The staff finds that the applicant appropriately evaluated the analysis in UFSAR Section 16.3.2.2 as a TLAA.

LRA Table 4.3-2 shows the projected cycles for 60 years of operation. The staff finds that the number of transient cycles will not exceed 100,000 for the period of extended operation.

4.7.2.3 Conclusion

The staff reviewed the applicant's TLAA for fatigue crack growth analysis in UFSAR Section 16.3.2.2 as summarized in LRA Section 4.7.2 and amended by letter dated April 6, 2007. The staff concludes that the applicant's TLAA for the fatigue crack growth analysis will comply with the 10 CFR 54.21(c)(1)(i) acceptance criterion for TLAAs.

4.7.3 TLAA in BWRVIP Documents

The BWRVIP documents identify various potential TLAA. The TLAA applicable to JAFNPP are described below.

4.7.3.1 BWRVIP-05, RPV Circumferential Welds

4.7.3.1.1 Summary of Technical Information in the Application

LRA Section 4.7.3.1 summarizes the BWRVIP-05 RPV circumferential weld evaluation for the period of extended operation. BWRVIP-05 justifies elimination of reactor vessel circumferential welds from examination. BWRVIP-74 extends this justification through the period of license renewal. SER Section 4.2.5 documents the evaluation of the TLAA for this issue.

4.7.3.1.2 Staff Evaluation

The staff reviewed LRA Section 4.7.3.1, 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.

LRA Section 4.7.3.1 refers to LRA Section 4.2.5 for the review of the TLAA on the issue of reactor vessel circumferential welds. SER Section 4.2.5 reports the staff's review of the information.

4.7.3.1.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of RPV circumferential welds in LRA Section A.2.2.1.5. On the basis of its review of the UFSAR supplement, pending resolution of **sOI 4.2.5-1**, the staff concludes that the summary description of the applicant's actions to address RPV circumferential welds is adequate.

4.7.3.1.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pending resolution of **sOI 4.2.5-1**, pursuant to 10 CFR 54.21(c)(1)(ii), that, for RPV circumferential welds, the analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3.2 BWRVIP-25, Core Plate

Electric Power Research Institute (EPRI) Topical Report No. TR-107284, "BWR Vessel and Internals Project: Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25)" (December 1996), provides augmented inspection recommendations and flaw evaluation guidelines established by the BWRVIP to assure the integrity of core plates in BWR designs. BWRVIP-25 reports BWRVIP's analysis of the aging effects on BWR core plates and their components as well as BWRVIP's recommended augmented inspection and flaw evaluation strategies for managing such aging effects.

4.7.3.2.1 Summary of Technical Information in the Application

LRA Section 4.7.3.2 summarizes the BWRVIP-25 core plate evaluation for the period of extended operation. The calculation of loss of preload on the core plate rim hold-down bolts is a potential TLAA per the SER for BWRVIP-25, which calculates the loss of preload for these bolts for 40 years. BWRVIP-25 Appendix B projects this calculation to 60 years, showing that the core hold-down bolts at JAFNPP will retain at least 81 percent of their preload through the period of extended operation. Preload of the core plate hold-down bolts is required to prevent lateral motion of the core plate for plants (like JAFNPP) that have not installed core plate wedges. A plant-specific calculation must determine minimum bolting requirements to prevent core plate motion. The applicant commits to a plant-specific calculation prior to the period of extended operation unless core plate wedges are installed during the remainder of the current licensing term. Thus, the loss of core plate hold-down bolt preload will be projected for the period of extended operation.

4.7.3.2.2 Staff Evaluation

The staff reviewed LRA Section 4.7.3.2, 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.

BWRVIP-25 reports that the analysis of loss of preload in core plate rim hold-down bolts, as a result of irradiation-assisted stress relaxation, is a potential TLAA for BWR applicants. The staff approved the BWRVIP-25 inspection and flaw evaluation guidelines in an SE dated December 7, 2000, concurring in the BWRVIP position on stress relaxation management in BWR core plate rim hold-down bolts.

The applicant stated that BWRVIP-25 calculates the loss of preload for the core plate rim hold-down bolts for 40 years operation and projects this calculation to 60 years of operation. The applicant also stated that the core hold down bolts will retain at least 81 percent of their preload through the period of extended operation; however, the applicant clarified that preload of the core plate hold-down bolts is required to prevent lateral motion of the core plate during normal, transient, seismic, and design-basis accident operating conditions. The applicant stated that a plant-specific calculation must determine minimum bolting preload requirements to prevent core plate lateral movement during these conditions. To address this issue, the applicant stated that it would amend the LRA to include a commitment to a plant-specific calculation prior to the period of extended operation unless core plate wedges are installed during the remainder of the current licensing term.

The design of the core plate does not include core plate wedges or plugs for restraint against lateral movement during normal operating conditions (including operational transients and heatups and cooldowns of the reactor), pressure-testing conditions, seismic events, or design-basis accident conditions. Instead, the core plate design relies on the rim hold-down bolts to prevent core plate lateral movement during these loading conditions.

During the audit and review, the staff reviewed the LRA and bases documents and determined that the documentation included no evaluation, calculation, or assessment of the amount of stress relaxation in the plant's core plate rim hold-down bolts. The applicant admits that stress relaxation of the core plate rim hold-down bolts is an aging effect needing management or analysis for the period of extended operation. As the CLB includes no analysis of stress relaxation of the core plate rim hold-down bolts, the staff concludes that the LRA needs a commitment to manage stress relaxation in the core plate rim hold-down bolts.

In RAI 4.7.3.2-1 dated January 12, 2007, the staff asked the applicant for the following information about the core plate rim hold-down bolts:

> Provide additional information demonstrating that the requirements specified in the BWRVIP-25 report, including Appendix B, are applicable to JAFNPP, based on the following:
>
> a. configuration and geometry of the JAFNPP core plate rim hold-down bolts,
>
> b. the temperature of the core plate rim hold-down bolts during normal operation, taking into consideration power uprate conditions, and
>
> c. projected bolt neutron fluence at the end of the period of extended operation, taking into consideration power uprate conditions.
>
> Include the actual values for bolt temperature and projected bolt neutron fluence in the above discussion, and explain how it was determined that the effects of temperature and neutron fluence at the end of the period of extended operation would result in less than a 20 percent loss of bolt preload.
>
> Provide a detailed description of the methodology and data used at JAFNPP to perform the above analyses, and include the basis for the stress relaxation curves.
>
> Demonstrate that, under the conditions stated in Scenario 3 of BWRVIP-25, Appendix A (determination of hold-down bolt loading with no credit for aligner pins or rim weld), the axial and bending stresses for the hold-down bolts with the mean and highest loading will not exceed the ASME Code, Section III allowable stresses for primary membrane and primary membrane plus bending, as a result of a 20 percent reduction in the specified bolt pre-load.
>
> Clearly state the assumptions on which this analysis is based, taking into consideration the fact that the approach recommended in Appendix A of BWRVIP-25 is based on an elastic finite element analysis of the core plate and hold-down bolts.

In its response dated February 12, 2007, the applicant amended the LRA and stated that, in lieu of responding to the specific request in RAI 4.7.3.2-1, Commitment No. 23 (JAFP-07-0019, February 1, 2007) on the LRA addresses the structural integrity of the core plate against lateral movement. The applicant amended the LRA and Commitment No. 23 in its response to RAI 4.7.3.2-1 dated April 7, 2007. Commitment No. 23 will require the following actions to ensure the structural integrity of the core plate against lateral movement during the period of extended operation:

- Enhance the BWR Vessel Internals Program with inspections of the core plate rim hold-down bolts.

- LRA Section A.2.2.7 is revised to add that the applicant will

  1. Install core plate wedges prior to the period of extended operation or

  2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate rim hold-down bolting in accordance with BWRVIP-25 and submit the inspection plan, along with the acceptance criteria and justification for the plan, two years prior to the period of extended operation for review and approval or

  3. Inspect core plate rim hold-down bolts in accordance with ASME Code Section XI or with a staff-approved version of BWRVIP-25.

  If the applicant selects Option 2, the analysis to determine acceptance criteria will address the information requested in RAIs 3.1.2-2A and 4.7.3.2-1.

The staff reviewed the applicant's commitment and noted that under the current design the core plate rim hold-down bolts serve as structural components maintaining core plate integrity against lateral movement. If the applicant selects Option 1 of Commitment No. 23, the installation of core plate wedges will replace the core plate rim hold-down bolts in maintaining core plate structural integrity against lateral movement during the period of extended operation. This maintenance is in accordance with the options of BWRVIP-25 and acceptable. If it selects Option 2, the applicant will: (1) complete a plant-specific analysis in accordance with BWRVIP-25 bolt loading analysis criteria to establish the number of core plate rim hold-down bolts needed to maintain core plate structural integrity against lateral movement, (2) submit the inspection plan for the core plate rim hold-down bolts and the technical bases (*i.e.*, justification and acceptance criteria) for the plan for review and approval. This option is acceptable because the staff has approved the BWRVIP criteria for plant-specific loading analyses of BWR core plate rim hold-down bolts in the staff SE dated December 7, 2000, and because the inspection plan for the core plate rim hold-down bolts will be submitted to the staff for review and approval at least two years prior to the period of extended operation and justified based on the results of the plant-specific loading analysis.

Based on this assessment, the staff concludes that Commitment No. 23 provides an acceptable basis for managing the effect of stress relaxation of the core plate rim hold-down bolts and core plate integrity during the period of extended operation and for accepting the TLAA on BWRVIP-25 in accordance with the 10 CFR 54.21(c)(1)(iii) TLAA acceptance criterion.

4.7.3.2.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the core plate in LRA Section A.2.2.7. As reported in SER Section 4.7.3.2.2, the applicant placed Commitment No. 23 on the LRA for assurance that stress relaxation of the core plate rim hold-down bolts would be managed during the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii) or that, as an alternative to inspection of the bolts, the plant would be modified by wedges installed in the core plate design as an alternative means of maintaining core plate structural integrity in lieu of the core plate rim hold-down bolts during the period of extended operation. On the basis of its review of the UFSAR supplement, as amended by Commitment No. 23, the staff concludes that the summary description of the applicant's actions to address the core plate is adequate.

4.7.3.2.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated by Commitment No. 23, pursuant to 10 CFR 54.21(c)(1)(ii), that core plate analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement, with Commitment No. 23, contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3.3 BWRVIP-38, Shroud Support

EPRI Topical Report No. TR-108823, "BWR Vessel and Internals Project: BWR Shroud Support Inspection and Flaw Evaluation Guidelines (BWRVIP-38)" (September 1997), provides augmented inspection recommendations and flaw evaluation guidelines established by the BWRVIP for core shroud supports in BWR designs. BWRVIP-38 reports in Section B.4, Appendix B, the impact of license renewal on metal fatigue assessments for BWR RPV core shroud support components. In this report, the BWRVIP stated that metal fatigue assessments for BWR RPV core shroud support components may be potential 10 CFR 54.3 TLAAs. The staff approved BWRVIP-38 in an SE dated March 1, 2001.

4.7.3.3.1 Summary of Technical Information in the Application

LRA Section 4.7.3.3 summarizes the BWRVIP-38 shroud support evaluation for the period of extended operation. The BWRVIP-38 fatigue analysis of the shroud support is considered a TLAA. The shroud support is included in the 60-year fatigue analysis and shows a 0.9 CUF. This analysis remains valid for the period of extended operation.

4.7.3.3.2 Staff Evaluation

The staff reviewed LRA Section 4.7.3.3, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

BWRVIP-38 Section B.4, Appendix B, reports that metal fatigue of a BWR core shroud support should be treated as a TLAA if the CLB includes a metal fatigue analysis for the component.

The applicant stated that the CUF-based metal fatigue analysis for the core shroud support meets the 10 CFR 54.3 definition of a TLAA. LRA Sections 4.3.1 and 4.3.1.1 addresses the core shroud support metal fatigue assessment in accordance with the BWRVIP-38 determination and is acceptable. SER Section 4.3.1.2 reports the staff's evaluation and basis for accepting the metal fatigue assessment for the core shroud support.

4.7.3.3.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the shroud support in LRA Section A.2.2.8. The staff determined that, pending acceptable resolution of RAI 4.3.1-1, the UFSAR Supplement summary description in LRA Section A.2.2.8 is consistent with this determination and acceptable. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the shroud support is adequate.

4.7.3.3.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the shroud support analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR supplement, pending acceptable resolution of RAI 4.3.1-1, contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3.4 BWRVIP-47-A, Lower Plenum

EPRI Topical Report No. TR-108727, "BWR Vessel and Internals Project: BWR Lower Plenum Inspection and Flaw Evaluation Guidelines (BWRVIP-47)" (December 1997), provides augmented inspection recommendations and flaw evaluation guidelines established by the BWRVIP for RPV lower plenum components in BWR designs. BWRVIP-47 Section B.4, Appendix B, assesses the impact of license renewal on the metal fatigue assessments for BWR RPV lower plenum components. In this report, the BWRVIP stated that metal fatigue of BWR RPV lower plenum may be a potential TLAA in accordance with 10 CFR 54.3.

4.7.3.4.1 Summary of Technical Information in the Application

LRA Section 4.7.3.4 summarizes the BWRVIP-47-A lower plenum evaluation for the period of extended operation. The BWRVIP-47 fatigue analysis of the lower plenum pressure boundary components is considered a TLAA. The bottom head, shroud support, and control rod drive penetrations in the lower plenum are included in the 60-year fatigue analysis. CUF values are 0.03, 0.90, and 0.0234 respectively. This analysis remains valid for the period of extended operation.

4.7.3.4.2 Staff Evaluation

The staff reviewed LRA Section 4.7.3.4, to verify pursuant to 10 CFR 54.21(c)(1)(i), that the analyses remain valid for the period of extended operation.

BWRVIP-47 Section B.4, Appendix B, reports that metal fatigue assessments of lower plenum areas should be treated as TLAAs if the CLB includes specific metal fatigue analyses for the lower plenum components. The applicant stated that the CLB includes CUF-based metal fatigue analyses for the RPV bottom head, core shroud support, and CRD penetrations and that these analyses meet the 10 CFR 54.3 definition of a TLAA. The applicant's determination is in accordance with BWRVIP-47 criteria for treating metal fatigue analyses of lower plenum components as potential TLAAs for the LRA and acceptable. LRA Sections 4.3.1 and 4.3.1.1 describe the metal fatigue assessment for the RPV bottom head, core shroud support, and CRD penetrations. SER Section 4.3.1.2 reports the staff's evaluation and basis for acceptance of the metal fatigue assessments for the RPV bottom head, core shroud support, and CRD penetrations.

4.7.3.4.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the lower plenum in LRA Section A.2.2.9. On the basis of its review of the UFSAR supplement, pending resolution of RAI 4.3.1-1,which is a part of **OI 4.3.1-1**, the staff concludes that the summary description of the applicant's actions to address the lower plenum is adequate.

4.7.3.4.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(i), that the lower plenum analyses remain valid for the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3.5 BWRVIP-74, Reactor Pressure Vessel

4.7.3.5.1 Summary of Technical Information in the Application

LRA Section 4.7.3.5 summarizes the BWRVIP-74 RPV evaluation for the period of extended operation. BWRVIP-74 and its SER address the following four TLAAs:

(1) P-T Curve Analyses - The SER concludes "a set of P-T curves should be developed for the heat-up and cool-down operating conditions in the plant at a given EFPY in the LR period." LRA Section 4.2.2 addresses the JAFNPP P-T curves.

(2) Fatigue - The SER states that license renewal applicants should not rely solely on the BWRVIP-74-A analysis but should verify that the number of cycles assumed in the original fatigue design is conservative. LRA Section 4.3.1 addresses RPV fatigue. The SER also states that staff concerns on environmental fatigue are not resolved and that each applicant should address environmental fatigue for the components covered by BWRVIP-74-A. LRA Section 4.3.3 addresses environmentally-assisted fatigue.

(3) Equivalent Margins Analysis for RPV Materials with Charpy USE Less than 50 ft-lb - BWRVIP-74-A states that the percentage reductions in Charpy USE for beltline materials are less than those specified for limiting BWR/3-6 plates and non-Linde 80 submerged arc welds. LRA Section 4.2.3 addresses Charpy USE for RPV materials.

(4) Material Evaluation for Exempting RPV Circumferential Welds from Inspection - LRA

Section 4.2.5 addresses RPV circumferential weld inspection relief.

4.7.3.5.2 Staff Evaluation

The staff determined that the applicant has developed a set of P-T curves. The applicant committed to submit additional P-T curves prior to the period of extended operation. SER Section 4.2.2 reports the staff evaluation of the P-T curves.

The staff determined that LRA Section 4.3.1 and LRA Table 4.3-1 include plant-specific metal fatigue analyses for the Class 1 RPV and RPV internal components and metal fatigue TLAAs and 60-year CUF values for these components. SER Section 4.3.1 reports the staff's evaluation of the metal fatigue TLAAs for these components. The staff also determined that the applicant had calculated plant-specific environmentally-impacted CUFs for the Class 1 components analyzed in NUREG-6260 and BWRVIP-74A and had provided the environmentally-impacted fatigue TLAA for these components in LRA Section 4.3.3 and LRA Table 4.3-3. SER Section 4.3.3 reports the staff's evaluation of the environmentally-impacted metal fatigue TLAAs for these components.

LRA Section 4.2.3 addresses the percent reductions in CvUSE. SER Section 4.2.3 reports the staff's evaluation of the information.

The staff evaluated the TLAA for relief from ISI of the RPV circumferential shell welds as reported in SER Section 4.2.5.

4.7.3.5.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the reactor pressure vessel in LRA Section A.2.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant's actions to address the reactor pressure vessel is adequate.

4.7.3.5.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, in compliance with 10 CFR 54.21(c)(1)(ii), that the TLAA items addressed in BWRVIP-74-A have been projected to the end of the period of extended operation, pending resolution of **sOIs 4.2.2-1, 4.2.3-1 and 4.2.5-1**. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.3.6 BWRVIP-76, Core Shroud

EPRI Topical Report No. TR-114232, "BWR Vessel and Internals Project, BWR Lower Plenum Inspection and Flaw Evaluation Guidelines (BWRVIP-47)" (November 1999), provides augmented inspection recommendations and flaw evaluation guidelines established by the BWRVIP for core shroud and core shroud repair assembly components in BWR designs. BWRVIP-74 Section K.4, Appendix K, assesses the impact of license renewal on metal fatigue assessments for BWR core shroud and core shroud repair assembly components. In this report, the BWRVIP stated that BWR core shroud and core shroud repair assembly component metal fatigue analyses may be

potential 10 CFR 54.3 TLAAs. The staff approved the BWRVIP recommended guidelines for augmented inspections and analyses of BWR core shroud and core shroud repair assembly components in an SE dated July 27, 2006.

4.7.3.6.1 Summary of Technical Information in the Application

LRA Section 4.7.3.6 summarizes the BWRVIP-76 core shroud evaluation for the period of extended operation. BWRVIP-76 Appendix K states that plant-specific analyses for shroud fatigue are reviewed for TLAAs. Review of the reactor vessel and internals design basis documents found no fatigue analysis nor CUF calculation for the shroud itself. Fatigue analyses (CUF calculations) were found for the shroud support and the shroud tie rod assemblies, and these are addressed in LRA Section 4.3.1.2. This TLAA is projected through the period of extended operation.

4.7.3.6.2 Staff Evaluation

The staff reviewed LRA Section 4.7.3.6, 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.

In BWRVIP-76, the BWRVIP concluded that metal fatigue analyses for core shroud and core shroud repair assembly components should be treated as TLAAs if the CLB includes corresponding plant-specific fatigue analyses for these components.

The applicant stated that the CUF analysis for the core shroud tie rod repair assemblies conforms to the 10 CFR 54.3 definition of a TLAA. This analysis is in accordance with the BWRVIP-76 determination and acceptable. LRA Sections 4.3.1 and 4.3.1.2 describe the applicant's evaluation of its TLAA for the core shroud tie repair assemblies. SER Section 4.3.1.2 reports the staff’s basis for acceptance of the 60-year CUF value for core shroud tie rod repair assemblies.

4.7.3.6.3 UFSAR Supplement

The applicant provided a UFSAR supplement summary description of its TLAA evaluation of the core shroud in LRA Section A.2.2.2.1. On the basis of its review of the UFSAR supplement, the staff concludes that the summary description of the applicant’s actions to address the core shroud is adequate.

4.7.3.6.4 Conclusion

On the basis of its review, as discussed above, the staff concludes that the applicant has demonstrated, pursuant to 10 CFR 54.21(c)(1)(ii), that the core shroud analyses have been projected to the end of the period of extended operation. The staff also concludes that the UFSAR supplement contains an appropriate summary description of the TLAA evaluation, as required by 10 CFR 54.21(d).

4.7.4 Assessment of Plant-Specific Fatigue Flaw Growth and Fracture Mechanics Evaluations

4.7.4.1 Summary of Technical Information in the Application

LRA Tables 3.1.2-1, 3.1.2-2, and 3.1.2-3 show TLAA - metal fatigue for managing fatigue-induced cracking for many Class 1 components (*e.g.*, reactor vessel internal attachments and welds, the incore monitor housing bolting, CRD housings, CRD stub tubes, the CRD return line, the reactor vessel (the shell, upper and bottom head and the closure flange), and the reactor vessel nozzles (including safe ends and thermal sleeves)) for various piping and instrumentation connections.

4.7.4.2 Staff Evaluation

SRP-LR Section 4.3 provides metal fatigue analysis guidance based on the CUF approach as specified in ASME Code Section III. LRA Section 4.3 addresses the requirements of the ASME Code Section III fatigue calculations. SER Section 4.0 reports the staff's evaluation of the ASME Code Section III fatigue calculations of LRA Section 4.3.

The ASME Code Section III fatigue analysis assumes no crack in the components; however, during operation, ASME Code Section XI allows flaws of certain sizes to remain in service. The staff believes that, as part of the TLAA, an evaluation of the known flaw in the affected component also should assess the stability of the final crack size at the end of the period of extended operation. The flaw evaluation should demonstrate that the affected component has sufficient fracture toughness to resist rapid crack propagation for the period of extended operation. The method for the flaw evaluation should follow ASME Code Section XI.

LRA Section 4.3 describes the flaw evaluation without much detail; therefore, in RAI 3.1.2-1 dated April 2, 2007, the staff asked the applicant (a) to indicate which Class 1 components in Table 3.1.2-1 contain indications or flaws which remained in service based on the acceptance criteria of ASME Code Section XI, (b) to describe the flaw evaluations (*e.g.*, procedures and assumptions) of the affected components in accordance with ASME Code Section XI, (c) to state the number of years assumed in the fatigue crack growth analysis, and (d) to demonstrate whether the affected components are acceptable for the period of extended operation.

In its response dated April 24, 2007, the applicant stated that it had studied the analyses of flaws detected during ISIs. The only TLAA found during this study was the fatigue analysis of the core shroud hardware installed to repair core shroud cracking. LRA Section 4.3.1.2 addresses this TLAA with other fatigue TLAAs. The applicant detected indications in the following eight components:

(1) Torus Shell

In a letter dated April 24, 2007, the applicant stated that the flaw in the torus shell had been removed, no longer exists, and has no flaw growth analysis. The staff notes that the structural integrity of the torus must satisfy ASME Code Section XI, Subarticle IWE. As part of the torus repair, the applicant requested relief from ASME Code Section XI, Subarticle IWE, requirements for pressure testing of the torus shell. By letter dated

July 8, 2005, the staff authorized the relief request. Information Notice 2006-01 addressed the torus shell cracking. The staff finds that the torus shell cracking has been repaired in accordance with ASME Code Section XI, Subarticle IWE; therefore, no flaw growth calculation is needed. In addition, the applicant will inspect the torus periodically in accordance with ASME Code Section XI, Subsection IWE. Disposition or analysis of any crack detected will be in accordance with Subarticle IWE. The staff finds the torus adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

(2) RHR Shutdown Cooling Line

In a letter dated April 24, 2007, the applicant stated that the flaw in the RHR shutdown cooling line had been removed, no longer exists, and has no flaw growth analysis. By letter dated August 9, 2005, the staff approved a temporary non-ASME Code repair of the subject piping. In the subsequent refueling outage, the applicant permanently repaired the pipe in accordance with ASME Code Section XI, Subarticle IWC-4000. The RHR shutdown cooling piping is classified as an ASME Class 2 component. The examination and repair of the pipe will follow the requirements of ASME Code Section XI, Subarticle IWC. Disposition or analysis of any crack detected in the shutdown cooling line will be in accordance with Subarticle IWC. Therefore, the staff finds the RHR shutdown cooling line adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

(3) Steam Dryer

In a letter dated April 24, 2007, the applicant stated that the steam dryer is a non-ASME Code, non-pressure boundary part. The flaws were found during inspections recommended by the BWRVIP as implemented through the ISI Program. The applicant evaluated the indications using BWRVIP-139, not ASME Code Section XI, guidance. One flaw was repaired during Refueling Outage 17 in 2006 and the other was within acceptance criteria for continued service. Subsequent inspection revealed that the remaining flaw remains within acceptance criteria for continued service. The applicant stated further that it will continue to monitor the flaw and to manage the effects of aging on the steam dryer through the period of extended operation in accordance with BWRVIP guidelines.

SER Section 3.0.3.2.7 reports in detail many issues related to the steam dryer. This review of the management of cracks in the steam dryer to the end of the period of extended operation is limited. The staff agrees with the applicant that the steam dryer is not an ASME Code or pressure boundary component and that the ASME Code requirements are not applicable. The applicant has used BWRVIP-139 to dispose of the cracks found in the steam dryer; however, the staff has not approved BWRVIP-139. After approval, the staff expects BWRVIP-139 to be revised to include any additional modifications or conditions that the staff may impose on that report and the applicant to follow the guidance in the approved BWRVIP-139 in the future. The staff finds the steam dryer adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

(4) Core Spray Line (Inside The Vessel)

In a letter dated April 24, 2007, the applicant stated that it had detected and has monitored two indications on the "B" loop core spray line inside the reactor vessel during inspections recommended by the BWRVIP.

According to the applicant, the first crack was discovered in 1988 between the core spray nozzle and core shroud and repaired with a clam shell sleeve, which is not an ASME Code repair and involves no flaw growth analysis. As the "new" pressure boundary for the cracked weld the clam shell sleeve essentially removes the existing flaw from service. The structural integrity of the flawed weld is not credited to demonstrate acceptability for continued service. The applicant inspected the clam shell sleeve repair as part of the BWRVIP Inspection Program for structural integrity and detected no cracking. The core spray piping inside the reactor vessel is not ASME Code piping.

The applicant detected the second indication at weld CSB-12 (P3) during Refueling Outage 14 in 2000. There was no change in the length of this indication between Refueling Outage 14 in 2000 and Refueling Outage 15 in 2002. The 2002 inspections and more detailed inspections in 2006 indicate that the indication is a scratch rather than a crack. As this indication is not a flaw, no repair was required.

The applicant stated further that it will continue to manage cracking of the core spray line, including these indications, under the BWRVIP per BWRVIP-18A guidelines through the period of extended operation.

The staff finds that the applicant has inspected the clam shell sleeve repair and has found no cracking. The applicant is managing and will manage the core spray line based on the staff-approved BWRVIP-18A Report. The staff finds the core spray line inside the reactor vessel adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

(5) Core Shroud Cracking

In a letter dated April 24, 2007, the applicant stated that it had inspected the core shroud per BWRVIP-76 guidelines during Refueling Outage 12 in 1996 and Refueling Outage 13 in 1998 and detected crack-like indications for vertical welds SV5A, SV5B, SV6A, SV6B and horizontal weld H4. Re-inspection intervals for the vertical welds are determined based on flaw growth analyses in accordance with BWRVIP guidelines.

According to the applicant, a shroud tie rod repair was installed to maintain shroud integrity if the horizontal welds fail; consequently, structural integrity of the shroud does not rely on the horizontal welds. The shroud repair (tie rods) is of a design different from that installed at the Hatch Nuclear Power Plant. The applicant stated that, therefore, the bracket of the shroud tie rods does not require repair to preclude the cracking experienced at the Hatch plant. The applicant inspects tie rods routinely as specified in BWRVIP-76 Program requirements. The ten tie rods were inspected during Refueling Outage 17 in 2006 with no degradation noted.

The staff finds that the applicant has followed the BWRVIP-76 requirements to inspect core shroud tie rods periodically; therefore, the staff finds the core shroud and the tie rods adequately managed for metal fatigue to maintain intended functions for the period of extended operation. The staff has not approved BWRVIP-76. After approval, the staff expects BWRVIP-76 to be revised to include any additional requirements that the staff may impose and the applicant to follow the approved BWRVIP-76 guidance. SER Section 4.3.1 reports the additional evaluation of the core shroud and tie rods.

(6) Main Steam Nozzle

In a letter dated April 24, 2007, the applicant stated that it had inspected main steam nozzles ultrasonically in 1988 as part of the ISI Program and detected a subsurface indication on main steam nozzle N3C. Re-inspection of the N3C nozzle in 1989 and 1990 revealed no discernable change in its size. The applicant believes that this indication is a minor weld defect accepted by radiography during plant construction. The applicant stated further that this indication is acceptable per ASME Code Section XI, Subsection IWB-3610(b), and no flaw growth analysis is required. The applicant will continue to monitor this indication through the ISI Program.

The staff finds that the applicant has followed ASME Code Section XI for inspection of the main steam nozzles and disposition of the crack. The staff confirmed that the size of the indication detected in 1988 has not changed in the successive inspections in 1989 and 1990 and that the applicant has a program for monitoring Nozzle N3C and other main steam nozzles in accordance with ASME Code Section XI. Therefore, the staff finds the main steam nozzles adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

(7) CRD Return Line Nozzle to End Cap Weld

In a letter dated April 24, 2007, the applicant stated that in 2000 it had discovered a crack on the inside diameter of the weld between the CRD return line nozzle and the end cap. The applicant repaired the CRD nozzle cap using a weld overlay. JAFNPP Relief Request RR-26 requested relief from 10 CFR 50.55a(c)(3) repair criteria for the CRD return nozzle cap. This relief request cited ASME Code Section XI, Code Case N-504-1, “Alternative Rules for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping, Section XI, Division 1 Weld Overlays to Address IGSCC Indications.” ASME Code Section XI, Code Case N-504-1, Section (g)(2), states that an evaluation of the repair

> shall demonstrate that the requirements of IWB-3640 from the 1983 Edition and Addenda [of the ASME Code, Section XI], are satisfied for the design life of the repair, considering potential flaw growth due to fatigue and the mechanism believed to have caused the flaw. The flaw growth evaluation shall be performed in accordance with Appendix C [of the ASME Code, Section XI].

The overlay carries the structural load carried previously by the flawed weld. The overlay analysis conservatively assumes that the underlying flaw is 100 percent through-wall and 360° around the pipe (*i.e.*, complete separation of the underlying pipe as described in NUREG-0313 Section 4.4.1). The applicant assumed the flaw would grow 100 percent

through the pipe wall thickness and thus took no credit for structural integrity of the underlying weld. Fatigue crack growth analysis is not needed because the design assumption for the weld overlay of the affected CRD return line cap weld is that the flaw will grow 100 percent through-wall.

The staff approved the relief request (RR-26) and on October 26, 2000, issued an SE concluding that the proposed alternative reasonably assures structural and pressure boundary integrity of the capped N9 nozzle of the reactor vessel and, thus, acceptable quality and safety.

The staff finds that the applicant has repaired the crack in the weld joining the CRD return line nozzle and the end cap based on the staff-approved weld overlay repair. The staff agrees with the applicant that a flaw growth analysis for the CRD crack is not needed because the weld overlay design assumption is that the crack is 100 percent through the pipe wall thickness and 360° around the pipe. The applicant will manage the CRD nozzles according to BWRVIP-75-A, which the staff has approved; therefore, the staff finds the CRD return line adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

(8) Weld Overlays to Address Intergranular Stress Corrosion Cracking (IGSCC) Indications

In a letter dated April 24, 2007, the applicant stated that it had applied 21 weld overlays to recirculation system piping and two overlays to jet pump instrumentation piping to address flaw indications detected during inspections performed for the IGSCC Program.

The applicant stated that the overlays were designed and installed in accordance with GL 88-01, NUREG-0313, Revision 2, and ASME Code Section XI. In particular, NUREG-0313 Section 4.4.1 suggests that the overlay be designed assuming the original crack was 100 percent through-wall of the pipe thickness with a length of 360° around the pipe circumference. The overlay then is designed large enough to assume all the loads previously borne by the flawed weld. There is no flaw growth analysis of the underlying flaw because the assumed flaw in the weld overlay design is the worst case.

The applicant stated further that, because the overlays are sized based on complete weld failure despite compression of the weld to prevent future crack growth (compressive residual stress minimizes future crack growth), the design is conservative and the affected components are acceptable for the period of extended operation. Confirmatory inspections of the weld overlays in the period of extended operation will be as specified by BWRVIP-75-A Section 3.5.1.1 guidelines.

The staff finds that the applicant has followed the guidance of NUREG-0313, Revision 2 in applying 21 weld overlays to recirculation system piping and two overlays to jet pump instrumentation piping. In addition, the applicant will follow the staff- approved BWRVIP-75-A guidance to monitor the integrity of the affected components. The staff finds the recirculation system and jet pump instrumentation piping adequately managed for metal fatigue to maintain intended functions for the period of extended operation.

4.7.4.3 UFSAR Supplement

The staff has provided its basis for concluding that the flaw evaluations and fracture mechanics evaluations evaluated by the staff as reported in SER Section 4.7.4.2 do not meet the 10 CFR 54.3 definition of a TLAA; therefore, the staff concludes that LRA Appendix A need not include any UFSAR Supplement summary descriptions for these flaw evaluations and fracture mechanics evaluations.

4.7.4.4 Conclusion

The staff evaluated the fracture mechanics evaluations and flaw evaluations that the applicant has indicated as potential TLAAs for the LRA. Based on the evaluation reported in SER Section 4.7.4.2, the staff concludes that these flaw evaluations and fracture mechanics evaluations do not meet the 10 CFR 54.3 definition of a TLAA. The staff also concludes that LRA Appendix A need not include any UFSAR Supplement summary descriptions for these flaw evaluations and fracture mechanics evaluations as required by 10 CFR 54.21(d) if determined to be TLAAs for the LRA.

4.8 <u>Conclusion for Time-Limited Aging Analyses</u>

The staff reviewed the information in LRA Section 4, “Time-Limited Aging Analyses.” On the basis of its review, the staff concludes, pending resolution of OI 4.2.1-1, and sOIs 4.2.2-1, 4.2.3-1, 4.2.4-1, 4.2.5-1, and 4.2.6-1, that the applicant has provided a sufficient list of TLAAs, as defined in 10 CFR 54.3 and that the applicant has demonstrated that: (1) the TLAAs will remain valid for the period of extended operation, as required by 10 CFR 54.21(c)(1)(i); (2) the TLAAs have been projected to the end of the period of extended operation, as required by 10 CFR 54.21(c)(1)(ii); or (3) that the effects of aging on the intended function(s) will be adequately managed for the period of extended operation, as required by 10 CFR 54.21(c)(1)(iii). The staff also reviewed the UFSAR supplement for the TLAAs and finds that the supplement contains descriptions of the TLAAs sufficient to satisfy the requirements of 10 CFR 54.21(d). In addition, the staff concludes, as required by 10 CFR 54.21(c)(2), that no plant-specific, TLAA-based exemptions are in effect.

With regard to these matters, the staff concludes that there is reasonable assurance that the activities authorized by the renewed license will continue to be conducted in accordance with the CLB, and any changes made to the CLB, in order to comply with 10 CFR 54.29(a), are in accordance with the Atomic Energy Act of 1954, as amended, and NRC regulations.

SECTION 5

REVIEW BY THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

In accordance with Title 10, Part 54, of the *Code of Federal Regulations*, the Advisory Committee on Reactor Safeguards (ACRS) will review the license renewal application (LRA) for James A. FitzPatrick Nuclear Power Plant. The ACRS Subcommittee on Plant License Renewal will continue its detailed review of the LRA after this safety evaluation report (SER) is issued. Entergy Nuclear Operations, Inc. (the applicant) and the staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) will meet with the subcommittee and the full committee to discuss issues associated with the review of the LRA.

After the ACRS completes its review of the LRA and SER, the full committee will issue a report discussing the results of the review. An update to this SER will include the ACRS report and the staff's response to any issues and concerns reported.

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SECTION 6

CONCLUSION

The staff of the United States (US) Nuclear Regulatory Commission (NRC) (the staff) reviewed the license renewal application (LRA) for James A. FitzPatrick Nuclear Power Plant in accordance with NRC regulations and US NRC Regulatory Guide (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 determines 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),” draft Supplement 31, “Generic Environmental Impact Statement for License Renewal of Nuclear Plants Regarding James A. FitzPatrick Nuclear Power Plant,” dated June 2007.

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APPENDIX A

JAFNPP LICENSE RENEWAL COMMITMENTS

During the review of the James A. FitzPatrick Nuclear Power Plant (JAFNPP) license renewal application (LRA) by the staff of the United States Nuclear Regulatory Commission (NRC) (the staff), Entergy Nuclear Operations, Inc. (the applicant) made commitments related to aging management programs (AMPs) to manage aging effects for structures and components. The following table lists these commitments along with the implementation schedules and sources for each commitment.

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
1	Implement the Buried Piping and Tanks Inspection Program as described in LRA Section B.1.1	A.2.1.1 B.1.1	October 17, 2014	JAFP-06-0109
2	Enhance the BWR CRD Return Line Nozzle Program to examine the CRDRL nozzle-to-vessel weld and the CRDRL nozzle inside radius section per Section XI Table IWB-2500-1 Category B-D Items B3.90 and B3.100.	A.2.1.2 B.1.2	October 17, 2014	JAFP-06-0109
3	Enhance the Diesel Fuel Monitoring Program to include periodic draining, cleaning, visual inspections, and ultrasonic measurement of the bottom surfaces of the fire pump diesel fuel oil tanks, EDG day tanks, and EDG fuel oil storage tanks to ensure that significant degradation is not occurring. Enhance the Diesel Fuel Monitoring Program to specify acceptance criteria for UT measurements of diesel generator fuel storage tanks within the scope of this program.	A.2.1.9 B.1.9	October 17, 2014	JAFP-06-0109
4	Enhance the External Surfaces Monitoring Program guidance documents to include periodic inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3). Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject systems will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(2).	A.2.1.11 B.1.11	October 17, 2014	JAFP-06-0109

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
5	Enhance the Fire Protection Program to inspect fire barrier walls, ceilings, and floors at least once every refueling outage. Inspection results will be acceptable if there are no visual indications of degradation such as cracks, holes, spalling, or gouges. Enhance the Fire Protection Program to inspect at least one seal of each type every 24 months.	A.2.1.13 B.1.13.1	October 17, 2014	JAFP-06-0109
6	Enhance the Fire Water Program to include inspection of hose reels for corrosion. Acceptance criteria will be enhanced to verify no significant corrosion. Enhance Fire Water Program to include visual inspection of spray and sprinkler system internals for evidence of corrosion. Acceptance criteria will be enhanced to verify no significant corrosion. Enhance Fire Water Program to include that a sample of sprinkler heads will be inspected using guidance of NFPA 25 (2002 Edition) Section 5.3.1.1.1. NFPA 25 also contains guidance to repeat sampling every 10 years after initial field service testing. Enhance Fire Water Program to include that wall thickness evaluations of fire water piping will be performed on system components using non-intrusive techniques to identify evidence of loss of material due to corrosion. These inspections will be performed before the end of the current operating term and at intervals thereafter during the period of extended operation. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.	A.2.1.14 B.1.13.2	October 17, 2014	JAFP-06-0109

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
7	Implement the Heat Exchanger Monitoring Program as described in LRA Section B.1.15.	A.2.1.16 B.1.15	October 17, 2014	JAFP-06-0109
8	Implement the Metal-Enclosed Bus Inspection Program as described in LRA Section B.1.17.	A.2.1.19 B.1.17	October 17, 2014	JAFP-06-0109
9	Implement the Non-EQ Instrumentation Circuits Review Program as described in LRA Section B.1.18.	A.2.1.20 B.1.18	October 17, 2014	JAFP-06-0109
10	Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section B.1.19.	A.2.1.21 B.1.19	October 17, 2014	JAFP-06-0109
11	Enhance the Oil Analysis Program to periodically sample lubricating oil in the security generator, and the fire pump diesel. Enhance the Oil Analysis Program to include viscosity and neutralization number determination of oil samples from components that do not have regular oil changes. Enhance the Oil Analysis Program to include particulate and water content for oil replaced periodically.	A.2.1.22 B.1.20	October 17, 2014	JAFP-06-0109

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
12	Implement the One-Time Inspection Program as described in LRA Section B.1.21.	A.2.1.23 B.1.21	Will be implemented within the 10 years prior to October 17, 2014	JAFP-06-0109
13	Enhance the Periodic Surveillance and Preventive Maintenance Program as necessary to assure that the effects of aging will be managed in accordance with JAF-RPT-05-LRD02.	A.2.1.24 B.1.22	October 17, 2014	JAFP-06-0109
14	Enhance the Reactor Vessel Surveillance Program to include the data analysis, acceptance criteria, and corrective actions described in LRA Section B.1.24.	A.2.1.26 B.1.24	October 17, 2014	JAFP-06-0109
15	Implement the Selective Leaching Program in accordance with the program as described in LRA Section B.1.25.	A.2.1.27 B.1.25 Audit Item 443 & 445	October 17, 2014	JAFP-06-0109

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
16	Enhance the Structures Monitoring Program procedure to: • specify that manholes, duct banks, underground fuel oil tank foundations, manway seals and gaskets, hatch seals and gaskets, underwater concrete in the intake structure, and crane rails and girders are included in the program. • include guidance for performing structural examinations of elastomers and rubber components to identify cracking and change in material properties. • include guidance for performing periodic inspections to confirm the absence of aging effects for lubrite surfaces in the torus radial beam seats and for lubrite surfaces in the torus support saddles. • perform an engineering evaluation on a periodic basis (at least once every five years) of groundwater samples to assess aggressiveness (pH < 5.5, chloride > 500 ppm and Sulfate > 1500) of groundwater to concrete. • inspect any inaccessible concrete areas that may be exposed by excavation for any reason, or any inaccessible area where observed conditions in accessible areas, which are exposed to the same environment, show that significant concrete degradation is occurring.	A.2.1.30 B.1.27.2 Audit Item 203 &287 Audit Item 201 Audit Item 201	October 17, 2014	JAFP-06-0109

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
17	Implement the Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program as described in LRA Section B.1.28.	A.2.1.31 B.1.28	October 17, 2014	JAFP-06-0109
18	Enhance the Water Chemistry Control - Auxiliary Systems Program to include guidance for sampling the control room and relay room chilled water, decay heat removal cooling water, and the security generator jacket cooling water.	A.2.1.32 B.1.29.1	October 17, 2014	JAFP-06-0109
19	Enhance the Bolting Integrity Program to include guidance from EPRI NP-5769 and EPRI TR-104213. Enhance the Bolting Integrity Program to clarify that actual yield strength is used in selecting materials for low susceptibility to SCC and to clarify the prohibition on use of lubricants containing MoS2 for bolting.	A.2.1.35 B.1.30	October 17, 2014	JAFP-06-0109
20	At least 2 years prior to entering the period of extended operation, for the locations identified in NUREG/CR-6260 for BWRs of the JAFNPP vintage, JAFNPP will implement one or more of the following: (1) Refine the fatigue analyses or develop new analyses (Class 1 RHR piping and Class 1 feedwater piping locations), if necessary, to determine valid CUFs less than 1 when accounting for the effects of reactor water environment. This includes applying the appropriate F_{en} factors to valid CUFs determined in accordance with one of the following options.	4.3.3 Audit Item 317	October 17, 2014	JAFP-06-0167

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
	1. For locations, including NUREG/CR-6260 locations, with existing fatigue analysis valid for the period of extended operation, use the existing **CUF** to determine the environmentally adjusted **CUF**. 2. More limiting JAFNPP-specific locations with a valid **CUF** may be added in addition to the NUREG/CR-6260 locations. 3. Representative **CUF** values from other plants, adjusted to or enveloping the JAFNPP plant specific external loads may be used if demonstrated applicable to JAFNPP. 4. For locations, including NUREG/CR-6260 locations, an analysis using the NRC-approved ASME code 2001 edition up to and including 2003 addendum, may be performed to determine a valid CUF. The determination of F_{en} will account for operating time with normal water chemistry and operating time with hydrogen water chemistry. (2) Manage the effects of aging due to fatigue at the affected locations by an inspection program that has been reviewed and approved by the NRC (e.g., periodic non-destructive examination of the affected locations at inspection intervals to be determined by a method acceptable to the NRC). (3) Repair or replace the affected locations before exceeding a CUF of 1.0.	Audit Item 485 &487		

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
	Should JAFNPP select the option to manage environmentally assisted fatigue during the period of extended operation, details of the aging management program such as scope, qualification, method, and frequency will be submitted to the NRC at least 2 years prior to the period of extended operation.			
21	Enhance the BWR Vessel Internals Program to inspect fifteen (15) percent of the top guide locations using enhanced visual inspection techniques. EVT-1, within the first 18 years of the period of extended operation, with at least one-third of the inspections to be completed within the first six (6) years and at least two-thirds within the first 12 years of the period of extended operations. Locations selected for examination will be areas that have exceeded the neutron fluence threshold.	A.2.1.7 and B.1.7 Audit Item 252	As stated in the commitment	JAFP-07-0048
22	Enhance the BWR Vessel Internals Program to ensure the effects of aging on the steam dryer are managed in accordance with the guidelines of BWRVIP-139 as approved by the NRC and accepted by the BWRVIP Executive Committee.	A.2.1.7 and B.1.7 Audit Item 245	October 17, 2014	JAFP-06-0167
23	Enhance the BWR Vessel Internals Program to perform inspections of the core plate rim hold down bolts. Appendix A.2.2.7 Core Plate is revised to add that JAFNPP will perform one of the following: 1. Install core plate wedges prior to the period of extended operation; or, 2. Complete a plant-specific analysis to determine acceptance criteria for continued inspection of core plate rim hold down	A.2.1.7 and B.1.7, 4.7.3.2 Audit Item 252 A.2.2.7 Audit Item 483 RAI 4.7.3.2-1	October 17, 2012	JAFP-07-0019

APPENDIX A: JAFNPP LICENSE RENEWAL COMMITMENTS				
Item Number	**Commitment**	**UFSAR Supplement Section/ LRA Section**	**Enhancement or Implementation Schedule**	**Source**
	bolting in accordance with BWRVIP-25 and submit the inspection plan, along with the acceptance criteria and justification for the inspection plan, to the NRC two years prior to the period of extended operation for NRC review and approval. If Option 2 is selected, the analysis to determine acceptance criteria will address the information requested in RAIs 3.1.2-2A and 4.7.3.2-1.			
24	Implement the Bolted Connections Program as described in LRA Section B.1.31.	A.2.1.36 B.1.31 Audit item 296	October 17, 2014	JAFP-07-0019
25	Implement the Oil-Filled Cable System aging management that will be controlled by the following programs: External Surfaces Monitoring Program Oil Analysis Program Periodic Surveillance and Preventive Maintenance Program	B.1.11 B.1.20 B.1.22	October 17, 2014	JAFP-07-0048

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 Entergy Nuclear Operations, Inc. (ENO). This appendix also lists other correspondence on the staff's review of the James A. FitzPatrick Nuclear Power Plant (JAFNPP) license renewal application (LRA) (under Docket No. 50-333).

APPENDIX B: CHRONOLOGY	
Date	**Subject**
June 26, 2006	Slides of Entergy Nuclear presentation to NRC on plans for submittal of license renewal application for JAFNPP (ADAMS Accession No. ML062070267)
July 27, 2006	Summary of June 26, 2006 meeting between the U.S. NRC Staff and Entergy Nuclear Operations, Inc (ENO) representatives to discuss readiness of JAFNPP LRA (ADAMS Accession No. ML062090176)
July 31, 2006	In a letter (signed by Pete Dietrich) (ADAMS Accession No. ML062160491), ENO submitted its application to renew the operating license of the JAFNPP. In its submittal, CEG provided an original signed hard copy of the application, with additional electronic copies of the application on CDs. Cover Page through Chapter 4 (ADAMS Accession No. ML062160494), Appendix A (ADAMS Accession No. ML062160553), Appendix B through Appendix D (ADAMS Accession No. ML062160556), Appendix E (ADAMS Accession No. ML062160557)
July 31, 2006	In a letter (signed by Pete Dietrich), ENO submitted a list of LRA Boundary Drawings used for the scoping phase of license renewal (ADAMS Accession No. ML062140125)
August 2, 2006	NRC released the 51 referenced boundary drawings. The drawings can be found within an ADAMS package (ADAMS Accession No. ML062140129)
August 4, 2006	NRC Press Release-06-100: NRC Announces Availability of LRA For JAFNPP (ADAMS Accession No. ML062160240)
August 7, 2006	In a letter (signed by P. T. Kuo), the NRC acknowledged receipt and availability of the LRA for JAFNPP (ADAMS Accession No. ML062190106)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
August 11, 2006	In the *Federal Register*, a "Notice of Receipt and Availability of Application for Renewal of James A. FitzPatrick Nuclear Power Plant" is published, concerning the JAFNPP LRA (ADAMS Accession No. ML071000081)
September 7, 2006	In a letter (signed by S. Hernandez), to Ms. Carol Ferlito of the Oswego Public Library, the NRC verified the library's willingness to maintain public documents related to the JAFNPP LRA (ADAMS Accession No. ML062500247)
September 7, 2006	In a letter (signed by S. Hernandez), to Ms. Mary Bennett of the Penfield Library, the NRC verified the library's willingness to maintain public documents related to the JAFNPP LRA (ADAMS Accession No. ML062500286)
September 14, 2006	In a letter (signed by F. Gillespie), to Mr. Peter Dietrich of ENO, the NRC provided Notice of Acceptance for Docketing of the Application and Notice of Opportunity for Hearing Regarding the LRA (ADAMS Accession No. ML062570127)
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable Barry E. Snyder, Seneca Nation of Indians, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480035)
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable Roger Hill, Tonawanda Band of Senecas, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480044)
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable James Ransom, St. Regis Mohawk Tribe, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480053)
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable Irving Powless Jr., Onondaga Indian Nation, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480057)
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable Ray Halbritter, Oneida Indian Nation, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480063)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable William Jacobs, Cayuga Nation, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480069)
September 15, 2006	In a letter (signed by R. Franovich), to The Honorable Leo Henry, Tuscarora Nation, the NRC requested comments concerning the JAFNPP LRA environmental review. (ADAMS Accession No. ML062480035)
September 15, 2006	In a letter (signed by Rani Franovich) to Ms. B. Castro, the NRC notified the New York State Office of Parks, Recreation, and Historic Preservation, that a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC rules that implement the National Environmental Policy Act of 1969 (NEPA). The letter also invited the office staff to the NEPA scoping meetings for the JAFNPP LRA. (ADAMS Accession No. ML062480220)
September 15, 2006	In a letter (signed by Rani Franovich) to Mr. Don Klima, the NRC notified the Advisory Council on Historic Preservation, that a site-specific Supplemental Environmental Impact Statement (SEIS) to its "Generic Environmental Impact Statement for License Renewal of Nuclear Plants" (GEIS), NUREG-1437, will be prepared under the provisions of 10 CFR Part 51, the NRC rules that implement the National Environmental Policy Act of 1969 (NEPA). The letter also invited the office staff to the NEPA scoping meetings for the JAFNPP LRA. (ADAMS Accession No. ML062480229)
September 19, 2006	In a letter (signed by R. Franovich) to Mr. Marvin Moriarty of the US Fish and Wildlife Office, the NRC requested a list of protected species within the evaluation area of the LRA review (ADAMS Accession No. ML062630292)
September 20, 2006	NRC Press Release-06-114: NRC Announces Opportunity to Request a Hearing on the LRA for JAFNPP (ADAMS Accession No. ML062630056)
September 20, 2006	In the *Federal Register*, a "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" is published, concerning the JAFNPP LRA (ADAMS Accession No. ML071000085)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
September 26, 2006	In a letter (signed by R. Franovich) to Mr. Peter Dietrich of ENO, the NRC provided Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping Process under the provisions of 10 CFR Part 51, to implement the National Environmental Policy Act of 1969 (NEPA) for License Renewal for JAFNPP (ADAMS Accession No. ML062480235)
October 3, 2006	NRC Press Release-I-06-055: NRC to Discuss Process for Review of LRA for JAFNPP, Seek Input on Environmental Review (ADAMS Accession No. ML062760465)
October 12, 2006	NRC Slides from environmental scoping meeting held on October 12, 2006 (ADAMS Accession No. ML062960154)
October 23, 2006	NRC released the Audit and Review Plan for the JAFNPP LRA (ADAMS Accession No. ML062780155)
October 30, 2006	NRC released a summary of the environmental scoping meetings held on October 12, 2006 (ADAMS Accession No. ML062980148)
October 30, 2006	NRC released the transcript of the afternoon (1:30 pm) environmental scoping meeting held on October 12, 2006 (ADAMS Accession No. ML063030195)
October 30, 2006	NRC released the transcript of the evening (7:00 pm) environmental scoping meeting held on October 12, 2006 (ADAMS Accession No. ML063030209)
October 30, 2006	NRC released a summary of the public environmental scoping meetings held on October 12, 2006 (ADAMS Accession No. ML062980148)
November 7, 2006	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML062850382)
November 7, 2006	In a letter (signed by R. Franovich) to Mr. Kenneth P. Lynch of the NY State Department of Environmental Conservation, the NRC requested a list of protected species within the evaluation area of the LRA review (ADAMS Accession No. ML062630292)
November 14, 2006	In a letter (signed by Joseph Heath, General Council) to the NRC, the Onondaga Nation opposed renewal of the operating license of JAFNPP (ADAMS Accession No. ML063240283)
November 14, 2006	In a letter (signed by Chris Hogan, PM) to the NRC, the NY State Dept. Of Env. Conservation provided its comments on the JAFNPP environmental review (ADAMS Accession No. ML063240331)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
November 22, 2006	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML063200113)
November 27, 2006	In a letter (signed by S. Hernandez) to Mr. Michael Kansler of ENO, the NRC scheduled its Environmental Site Audit (ADAMS Accession No. ML063250406)
November 29, 2006	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML063200126)
November 30, 2006	In a letter (signed by Tara Seoane, Information Services) to the NRC, the NY State Natural Heritage Program provided a list of rare plants and animals within the JAFNPP environmental review site (ADAMS Accession No. ML063470489)
December 4, 2006	NRC released the Aging Management Program (AMP) audit Q & A database (ADAMS Accession No. ML063400415)
December 6, 2006	In a letter (signed by Pete Dietrich) (ADAMS Accession No. ML063480585), ENO submitted amendment No. 1 to its application to renew the operating license of the JAFNPP. The amendment contained the License Renewal Commitments List (ADAMS Accession No. ML063480596) as well as responses to RAIs
December 7, 2006	In a letter (signed by Anthony Wonderley, Historian) to the NRC, the Oneida Indian Nation explained the JAFNPP was outside of their territory (ADAMS Accession No. ML063480314)
December 21, 2006	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 2 to its application to renew the operating license of the JAFNPP. The amendment contained responses to RAIs (ADAMS Accession No. ML063600160)
December 28, 2006	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 3 to its application to renew the operating license of the JAFNPP. The amendment contained responses to scoping and screening RAIs (ADAMS Accession No. ML070030392)
January 8, 2007	In a letter (signed by K. Howard) to Mr. Michael Kansler, the NRC informed ENO of environmental PM and scheduling changes (ADAMS Accession No. ML063550121)
January 12, 2007	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML070080014)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
January 19, 2007	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML070120196)
January 24, 2007	In a letter (signed by Robert Snyder, Section Chief) to the NRC, the NY Department of Health supplied previously requested environmental information (ADAMS Accession No. ML063240283)
January 26, 2007	NRC released a summary of the environmental site audit conducted the week of 12/4/06 (ADAMS Accession No. ML070220055)
January 29, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 4 to its application to renew the operating license of the JAFNPP. The amendment contained responses to RAIs (ADAMS Accession No. ML0700370170)
February 1, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 5 to its application to renew the operating license of the JAFNPP. The amendment contained responses to RAIs (ADAMS Accession No. ML070440127)
February 7, 2007	NRC released the updated Aging Management Program (AMP) and Aging Management Review (AMR) audit Q & A database (ADAMS Accession No. ML070380389)
February 12, 2007	Note to File (signed by N. B. Le) - Docketing of email correspondence related to JAFNPP LRA (ADAMS Accession No. ML070440181)
February 12, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 6 to its application to renew the operating license of the JAFNPP. The amendment contained responses to RAIs (ADAMS Accession No. ML070520263)
February 14, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 7 to its application to renew the operating license of the JAFNPP. The amendment contained responses to RAIs (ADAMS Accession No. ML070530316)
February 20, 2007	Note to File (signed by Pete Dietrich) - Docketing of email correspondence related to JAFNPP LRA (ADAMS Accession No. ML070520059)
February 20, 2007	NRC received an email from ENO containing GE document NE-B1100732-01, Revision 1 “Plant Fitzpatrick RPV Surveillance Materials Testing and Analysis of 120deg Capsule @ 13.4 EFPY” (ADAMS Accession No. ML070520661)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
February 23, 2007	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML070370023)
March 2, 2007	In a letter (signed by J. Davis) to Mr. Michael Kansler of ENO, the NRC provided the Environmental Scoping Summary Report associated with the review of JAFNPP LRA (ADAMS Accession No. ML070440393)
March 7, 2007	In a letter (signed by R. Franovich), to Ed Alkiewicz, Senior Environmental Scientist with NY Power Authority, the NRC provided information concerning transmission line corridors related to the JAFNPP LRA review (ADAMS Accession No. ML070400185)
March 12, 2007	NRC released a summary of a telephone conference held on February 26, 2007 between ENO and NRC staff to discuss RAIs (ADAMS Accession No. ML070600186)
March 14, 2007	NRC released a summary of a telephone conference held on March 5, 2007 between ENO and NRC staff to discuss RAIs (ADAMS Accession No. ML070670266)
March 15, 2007	NRC released a summary of the telephone conferences held on January 31, 2007 and February 13, 2007 between ENO and NRC staff to discuss RAIs (ADAMS Accession No. ML070670227)
April 2, 2007	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML070850605)
April 6, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 8 to its application to renew the operating license of the JAFNPP. The amendment dealt with RAIs related to section 4.3.1 of the LRA (ADAMS Accession No. ML071070214)
April 6, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 9 to its application to renew the operating license of the JAFNPP. The amendment contained updated commitments, responses to RAIs, and an updated audit Q & A database (ADAMS Accession No. ML071060390)
April 10, 2007	In a letter (signed by Pete Dietrich) to NY State Dept. Of Environmental Conservation, ENO applied for an extended water quality permit (ADAMS Accession No. ML071170388)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
April 24, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No. 10 to its application to renew the operating license of the JAFNPP. The amendment contained responses to RAIs (ADAMS Accession No. ML071210240)
April 25, 2007	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML071100235)
May 4, 2007	Note to File (signed by N.B. Le) - Docketing of email correspondence related to JAFNPP LRA (ADAMS Accession No. ML071270080)
May 4, 2007	In an email (from N.B. Le) to Mr. Rick Plasse fo ENO, the NRC requested clarification on an RAI response (ADAMS Accession No. ML071270377)
May 17, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No.11 to its application to renew the operating license of the JAFNPP. (ADAMS Accession No. ML071430185)
May 21, 2007	In a letter (signed by Edward Alkiewicz, Environmental Studies Manager) to the NRC, the NY Power Authority provided a response regarding potential stream crossing erosion (ADAMS Accession No. ML063240283)
May 21, 2007	In a letter (signed by R. Franovich) to Mr. Marvin Moriarty of the US Fish and Wildlife Office, the NRC provided a biological assessment for the LRA review (ADAMS Accession No. ML071160167)
May 21, 2007	NRC released a biological assessment for the JAFNPP LRA (ADAMS Accession No. ML071160186)
May 24, 2007	NRC released a summary of a telephone conference held on March 21, 2007 between ENO and NRC staff to discuss RAIs (ADAMS Accession No. ML070960030)
June 4, 2007	NRC released a notice of a significant public meeting on June 21, 2007 to discuss inspection results cover scoping and AMP portions of LRA review. (ADAMS Accession No. ML071550279)
June 8, 2007	In a letter (signed by R. L. Franovich) to Mr. Michael Kansler of ENO, the NRC informed Entergy of the availability of site-specific supplement 31 to the Generic Environmental Impact Statement for the JAFNPP LRA. (ADAMS Accession No. ML071240156)
June 8, 2007	In a letter (signed by R. L. Franovich) to Ms. Carol Ash of NY Parks, Recreation & Historic Preservation, the NRC updated the status of its environmental review. (ADAMS Accession No. ML071240271)

APPENDIX B: CHRONOLOGY	
Date	**Subject**
June 8, 2007	In a letter (signed by R. L. Franovich) to the US Environmental Protection Agency, the NRC filed the site-specific supplement 31 to the Generic Environmental Impact Statement for the JAFNPP LRA. (ADAMS Accession No. ML071240405)
June 19, 2007	In a letter (signed by N. B. Le) to Mr. Michael Kansler of ENO, the NRC informed Entergy of the availability of a report documenting the results of the audit and LRA review. (ADAMS Accession No. ML071580049)
June 20, 2007	In a letter (signed by Pete Dietrich), ENO submitted amendment No.12 to its application to renew the operating license of the JAFNPP. (ADAMS Accession No. ML071770168)
July 25, 2007	In a letter (signed by N.B. Le) to Mr. Peter Dietrich of ENO, the NRC provided Requests for Additional Information for the Review of JAFNPP LRA (ADAMS Accession No. ML072010267)
July 30, 2007	In a letter (signed by P. T. Kuo) to Mr. Peter Dietrich of ENO, the NRC provided Entergy with a Safety Evaluation Report (SER) with Open Items. (ADAMS Accession No. ML071580299)
July 31, 2007	In a Memo (signed by Rajender Auluck) to Mr. Frank Gillespie the Advisory Committee on Reactor Safeguards (ACRS), requested that ACRS review the Safety Evaluation Report (SER) with Open Items for the JAFNPP LRA. (ADAMS Accession No. ML071570249)

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APPENDIX C

PRINCIPAL CONTRIBUTORS

This appendix lists the principal contributors for the development of this safety evaluation report (SER) and their areas of responsibility.

APPENDIX C: PRINCIPAL CONTRIBUTORS	
Name	**Responsibility**
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Pacific Northwest Laboratories	GALL Audit
Pacific Northwest Laboratories	Balance of Plant

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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 James A. FitzPatrick Nuclear Power Plant.

	REFERENCES
Number	**References**
1	JAFNPP License Renewal Application, dated August 1, 2006
2	NUREG-1800, Revision 1, “Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants,” September 2005.
3	NUREG-1801, Revision 1, “Generic Aging Lessons Learned (GALL) Report,” September 2005.
4	NEI 95-10, Revision 5, “Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule,” September 2005.
5	Letter from the NRC to Entergy, “Request for Additional Information for the Review of the James A. FitzPatrick Nuclear Power Plant License Renewal Application,” dated November 22, 2006 (ADAMS Accession No. ML063200113).
6	Letter from Entergy to the NRC, “Entergy Nuclear Operations Inc., James A. FitzPatrick Nuclear Power Plant, Docket No. 50-333, License No. DPR-59, License Renewal Application, Amendment 2,” dated December 21, 2006 (ADAMS Accession No. ML063600160).
7	Scoping and Screening Methodology Audit Trip Report Regarding the Entergy Nuclear FitzPatrick, LLC and Entergy Nuclear Operations, Inc., License Renewal Application for the James A. FitzPatrick Nuclear Power Plant, dated March 7, 2007 (ADAMS Accession No. ML070710235).
8	NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking,” November 1980.
9	NUREG-0313, Revision 2, “Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping,” 1988.
10	NRC GL 88-01, “NRC Position on IGSCC in BWR Austenitic Stainless Steel Piping,” January 1988, Supplement 1, September 1992.
11	10 CFR Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors, Office of the Federal Register, National Archives and Records Administration,” 2000.

12	NUREG-1433, Revision 3, “Standard Technical Specifications General Electric Plants, BWR/4,” Volume 1, June 2004.
13	Regulatory Guide 1.137, “Fuel-Oil Systems for Standby Diesel Generators,” Revision 1, October 1979.
14	ASTM Standard D 2276-00, “Standard Test Method for Particulate Contaminant in Aviation Fuel by Line Sampling,” 2000.
15	ASTM Standard D 2709-96, “Standard Test Method for Water and Sediment in Middle Distillate Fuels by Centrifuge,” 1996.
16	ASTM Standard D 4057-95, “Standard Practice for Manual Sampling of Petroleum and Petroleum Products,” 2000.
17	ASTM Standard D 1796-04, “Standard Test Method for Water and Sediment in Fuel Oils by the Centrifuge Method,” 2004.
18	ASTM Standard D 975-06, “Standard Specification for Fuel Oils,” 2006.
19	ASTM Standard D 6217, “Standard Test Method for Particulate Contamination in Middle Distillate Fuels by Laboratory Filtration,” 2003.
20	IEEE Std. P1205-2000, “IEEE Guide for Assessing, Monitoring and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Power Generating Stations.”
21	NUREG/CR-5643, “Insights Gained From Aging Research,” NRC: March 1992.
22	SAND 96-0344, “Aging Management Guideline for Commercial Nuclear Power Plants Electrical Cable and Terminations,” prepared by Sandia National Laboratories for the U.S. Department of Energy, September 1996.
23	NUREG/CR-5704, “Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,” U.S. Nuclear Regulatory Commission: April 1999.
24	NUREG/CR-6260, “Application of NUREG/CR 5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” U.S. Nuclear Regulatory Commission: March 1995.
25	NUREG/CR-6583, “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels,” U.S. Nuclear Regulatory Commission: March 1998.
26	NRC Generic Letter 89-08, “Erosion/Corrosion Induced Pipe Wall Thinning,” U.S. Nuclear Regulatory Commission: May 2, 1989.
27	NRC IE Bulletin 87-01, “Thinning of Pipe Walls in Nuclear Power Plants,” U.S. Nuclear Regulatory Commission: July 9, 1987.
28	“Cable and Terminations,” prepared by Sandia National Laboratories for the U.S. Department of Energy: September 1996.

29	NRC Information Notice 97-46, “Unisolable Crack in High-Pressure Injection Piping,” U.S. Nuclear Regulatory Commission: July 9, 1997.
30	Regulatory Guide 1.147, “Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1,” Revision 14.
31	Regulatory Guide 1.65, “Materials and Inspections for Reactor Vessel Closure Studs,” October 1973.
32	ASME Boiler and Pressure Vessel Code, 1989 Edition, Section XI.
33	ASME Boiler and Pressure Vessel Code, 1998 Edition with 2000 Addenda, Section XI.
34	NEI 03-08 “Guideline for the Management of Materials Issues,” May 2003.
35	GSI 190, "Fatigue Evaluation of Metal Components for 60-year Life NUREG/CR-6583 (ANL-97/18), Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels," March 1998.
36	NUREG-0661, Mark 1 Long Term Program Technical Report MPR-751, “Mark 1 Containment Program Augmented Class 2/3 Fatigue Evaluation Method and Results for Typical Torus Attached and SRV Piping Systems,” November 1982.
37	NRC Letter, C. I. Grimes to C. Terry, Safety Evaluation for Referencing of BWR Vessel and Internals Project, “BWR Core Plate Inspection and Flaw Evaluation Guidelines (BWRVIP-25) Report for Compliance with the License Renewal Rule (10 CFR Part 54) and Appendix B, BWR Core Plate Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21),” December 7, 2000.
38	NRC Letter, C. I. Grimes (NRC) to C. Terry, (BWRVIP Chairman), Acceptance for Referencing of EPRI Proprietary Report TR-113596, "BWR Vessel and Internals Project, BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines (BWRVIP-74) and Appendix A, Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21)," October 18, 2001.
39	NRC Letter, M. K. Gamberoni (NRC) to J. Knubel (PASNY), “Relief Request No. 17 - Request for Relief from the Requirements of 10 CFR 50.55a(g)(6)(ii)(A)(2) for Augmented Inspection of the Circumferential Welds in the Reactor Vessel of the James A. Fitzpatrick Nuclear Power Plant (TAC No. MA6215),” February 22, 2000.
40	NRC Letter, G. C. Lainas (NRC) to C. Terry (BWRVIP), “Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report (TAC No. M93925),” July 28, 1998.
41	BWRVIP-74-A (EPRI Report 1008872), “BWRVIP-74-A: BWR Vessel and Internals Project BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines for License Renewal,” June 2003.

42	BWRVIP-135 (EPRI Report 1011019), “BWR Vessel and Internals Project, Integrated Surveillance Program (ISP) Data Source Book and Plant Evaluations,” 2004.
43	JAF Updated Final Safety Analysis Report, Revision 12, May 2005.
44	NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," March 1996.
45	ASME Boiler and Pressure Vessel Code, Section XI, Subsections IWA, IWC, IWD, IWE, and IWF.
46	ASME Boiler and Pressure Vessel Code, Section XI, Subsection NF.
47	10 CFR Part 100, "Reactor Site Criteria."
48	10 CFR Part 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants."
49	10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities."
50	10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions."
51	NUREG-1437, Supplement 31, "Generic Environmental Impact Statement for License Renewal of Nuclear Power Plants Regarding James A. FitzPatrick Nuclear power Plant Draft Report for Comment,” June 8, 2007.
The following references were reviwed on site	
52	JAF-RPT-05-LRD02, "JAFNPP License Renewal Project Aging Management Program Evaluation Report,” Section 3.1, “Buried Piping and Tanks Inspection,” Revision 4.
53	JAF-RPT-05-LRD05, “JAFNPP License Renewal Project Operating Experience Review Results,” Revision 0, May 4, 2006.
54	Condition Report CR-JAF-1993-502, June 22, 1993.
55	NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking,” November 1980.
56	JAF-RPT-05-LRD02, “JAFNPP License Renewal Project Aging Management Program Evaluation Report," Section 4.1, “BWR CRD Return Line Nozzle,” Revision 4.
57	JPN-83-64, “CRD Return Line Modifications (NUREG-0619),” July 7, 1983.
58	NRC SER on JPN-83-64, “NRC Safety Evaluation of the CRD Return Line Modifications,” August 25, 1983.

59	JAFP-00-0239, “Letter to NRC: Proposed Alternative for the Contingency Repair of the CRD Cap to RPV Nozzle per GL 88-01 B Relief Request (RR-26),” October 15, 2000.
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